

A revision of the genus *Trophon* Montfort, 1810 (Gastropoda: Muricidae) from southern South America

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ABSTRACT

The genus *Trophon* from southern South America is revised and restricted to ten valid species from among the 36 nominal species still currently used. In addition, a new species, *Trophon parodizi* from Patagonian waters, is described. Adult specimens of the new taxon are illustrated, described and compared with other living species of the same genus and similar geographic distribution. Redescription and re-illustration of types, based on material from several institutions around the world are provided for *Trophon geversianus* (Pallas, 1774), *T. plicatus* (Lightfoot, 1756), *T. patagonicus* (d'Orbigny, 1839), *T. acanthodes* Watson, 1882, *T. pelsenceri* Smith, 1915, *T. amettei* Carcelles, 1946, *T. clenchi* (Carcelles, 1953), *T. willhelmensis* Ramirez-Bohme, 1981, and *T. bahamondei* McLean and Andrade, 1982. In addition, "*Trophon*" *malvinarum* Strebel, 1908, assigned to *genera incerta*, is also redescribed and illustrated.

INTRODUCTION

Among many groups of marine gastropods from South American waters in need of a modern comprehensive revision, the high diversity and abundance exhibited by the muricid genus *Trophon* Montfort, 1810, renders it particularly interesting. Early collections include a large and varied array of specimens obtained by 19th century expeditions from shallow waters of a vast area including more than 5,000 km of coast in Argentina. A taxonomic revision of these gastropods revealed that a large number of names should be placed in synonymy. The taxonomy and nomenclature thus clarified is sure to improve the usefulness of this genus and its species as tools for biogeographic and evolutionary interpretations, without forgetting that clear specific delimitation is crucial to other uses such as the commercial exploitation of the type species (*Trophon geversianus*) in southern Chile.

The subfamily Trophoninae is one of the most conspicuous groups of marine gastropods living presently around the southern tip of South America. The southern origin of the group seems to be beyond doubt, as discussed by Griffin and Pastorino (2005), when revising

the numerous extinct species appearing in the fossil record since the late Oligocene.

This article constitutes a review of all living species of *Trophon* from both coasts of southern South America. The study involves only those taxa living in environments associated with the continental shelf. Accordingly, *T. mucronae* Houart, 1991, from 1500–1575 m off Brazil and the subantarctic *T. veronicae* Pastorino, 1999, are not considered herein. These two deep-water species seem to belong in a different group according to data available on the radula, protoconch, and penis of *T. veronicae*. Such anatomical data remain unknown for *T. mucronae*. In addition, *T. ohlini* Strebel, 1904, with a distinct protoconch and radula, different from those of other Patagonian species and resembling the boreal *Boreotrophon truncatus*, will be the subject of a future paper. Finally, *T. triacanthus* Castellanos et al., 1987, recently described under *Trophon*, is also considered as belonging to a different genus—possibly *Apyxistus*—according to several differences in protoconch and shell morphology.

Houart (2003) recently described three new species under the genus *Trophon* sensu lato from dredgings more than 1000 m in depth. No radular, anatomical, or protoconch information is included in the descriptions. However, enough differences can be observed in the shells that, as mentioned by Houart himself, a new genus may be granted for these species. A similar situation is true for "*Trophon*" *malvinarum*; however, as there are no accurate illustrations or recent descriptions of this species I decided to include it in this work as belonging to an indeterminate genus.

For each of the species considered herein, adult specimens, operculum, gross anatomy, radula, protoconch, and ultrastructure of the shell are described whenever enough material was available. This work is part of a complete revision of the genus including all species from South America and Antarctica.

MATERIALS AND METHODS

All the material examined is housed in the collections of the Museo Argentino de Ciencias Naturales "Bernardino

Rivadavia", Buenos Aires (MACN-In); Museo de La Plata, La Plata (MLP); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM) and American Museum of Natural History, New York (AMNH). Part of the type material is housed in the following museums: The Natural History Museum, London, (BMNH); Zoologisches Institut und Zoologisches Museum der Universität Hamburg, (ZMH); Swedish Museum of Natural History, Stockholm, (NHRM); Museum national d'Histoire naturelle, Paris (MNHN); Museo Nacional de Historia Natural, Santiago, Chile (MNHNS); Museo Nacional de Historia Natural, Montevideo, Uruguay (MNHNM); Academy of Natural Sciences of Philadelphia (ANSP) and Los Angeles County Museum of Natural History (LACM). Finally, several historical specimens from the Auckland Institute and Museum, New Zealand (AK) were examined for comparative purposes. Material from the USNM originates from the United States Antarctic Program (USAP) and was mostly collected by two ships: R/V HERO and R/V ELTANIN. Material collected by the Uruguayan ship R/V ALDEBARAN is also included.

Dissections were performed on ethanol-preserved specimens for study of gross anatomy, with emphasis on the morphology of the anterior alimentary system, and the pallial portions of the male and female reproductive systems. Radulae were prepared according to the method described by Solem (1972) and observed using a LEO 440 scanning electron microscope (SEM) at the USNM and a Philips XL 30 at MACN. Radular terminology follows Kool (1993, fig. 6B). Shell ultrastructure data were procured from freshly fractured colabral sections taken from the central portion of the lip on the last whorl of two individuals per taxon, whenever sufficient material was available.

Photographs were taken using a digital scanning camera. Several images were scanned from black and white 35 mm negatives using a slide scanner. All images were digitally processed.

For the convenience of the reader in the Additional Material Examined sections, "D" means that the specimens were collected dead and "A" means alive.

SYSTEMATICS

Class Gastropoda Cuvier, 1791
 Subclass Orto-gastropoda Ponder and Lindberg, 1996
 Superorder Caenogastropoda Cox, 1959
 Order Sorbeoconcha Ponder and Lindberg, 1996
 Infraorder Neogastropoda Wenz, 1938
 Family Muricidae da Costa, 1776
 Subfamily Trophominae Cossmann, 1903
 Genus *Trophon* Montfort, 1810

Type Species: *Murex magellanicus* Gmelin, 1791 (= *Buccinum geversianum* Pallas, 1774) by original designation. *Polyplex* Perry, 1811 (type species *Polyplex bulbosa* Perry, 1811 = *Buccinum geversianum* Pallas, 1774) and *Muricidea* Swainson, 1840 (type species *Murex magellanicus* Chemnitz, 1780 (*nomen nudum*) = *Murex ma-*

gellanicus Gmelin, 1791 = *Buccinum geversianum* Pallas, 1774) are synonyms.

Description: Shells variable in size, ranging from about 1 to more than 10 centimeters high, fusiform, subquadrate to elongate. Protoconch paucispiral, with 2 to 2½ asymmetrical, smooth, slightly globose, and regularly convex whorls. Spire of about 4 whorls, equal or slightly shorter than aperture height, never higher. Subsutural ramp generally present, variously developed and slightly inclined posteriorly, defining a conspicuous keel. Axial sculpture variable, from weak growth lines to strong lamellae—in some instances even growing over the subsutural ramp; axial sculpture generally better developed than spiral sculpture. Lamellae along keel sometimes growing into fairly strong, always open, spines, which may even curve backwards. Spiral ornamentation variably developed; sometimes missing, but generally consisting of slightly rounded and equally developed cords, wider than interspaces and sometimes accompanied by weaker secondary intercalated ones. Spiral ornamentation usually restricted to surface abapical to keel, while missing along subsutural ramp and in some cases only present in the earliest whorls. Aperture subovoid; outer lip sharp, sometimes slightly reflected, but always smooth throughout. Siphonal canal always present and open, although variably developed in length, sometimes curved. Umbilicus variable, usually open, wide, although in some species totally absent or represented by a chink.

Shell ultrastructure arranged invariably in 2 layers: innermost layer of crossed lamellar aragonite, outer layer of amorphous calcite. Relative thickness of both layers variable according to species or—within a given species—latitude at which the population lives.

Radulae rachiglossate, rachidian teeth with 3 median cusps, the central one the larger and the lateral ones with a denticle, sometimes obsolete but always present, attached to the interior margin (never free). Rachidian base always sinuous and with the base offset under the proximal tooth. Marginal cusps always single, never bifid. Lateral teeth always thin, with the attachment area also thin. Operculum circular or suboval tear-shaped, attachment area with horseshoe shaped scars.

Accessory salivary glands always developed, tubular, single or coiled and unfilled. Esophagus with a loop running along the left side of the gland of Leiblein; esophageal glands externally invisible.

Egg-capsules always erect, never lenticular, usually with nurse eggs.

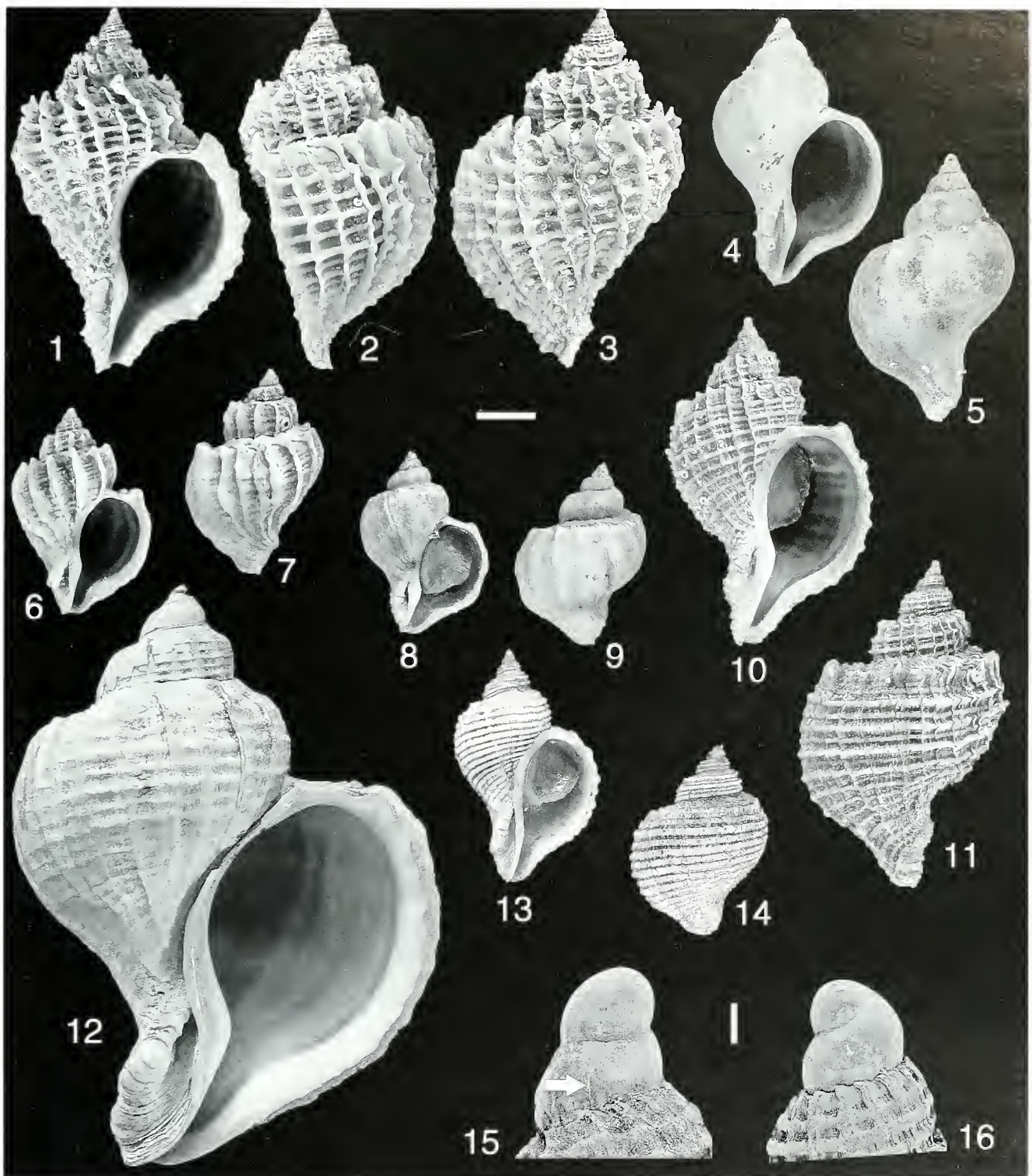
Trophon geversianus (Pallas, 1774)
 (Figures 1–21)

"Purpurschnecken" Knorr, 1769: 47, pl. 30, fig. 2.

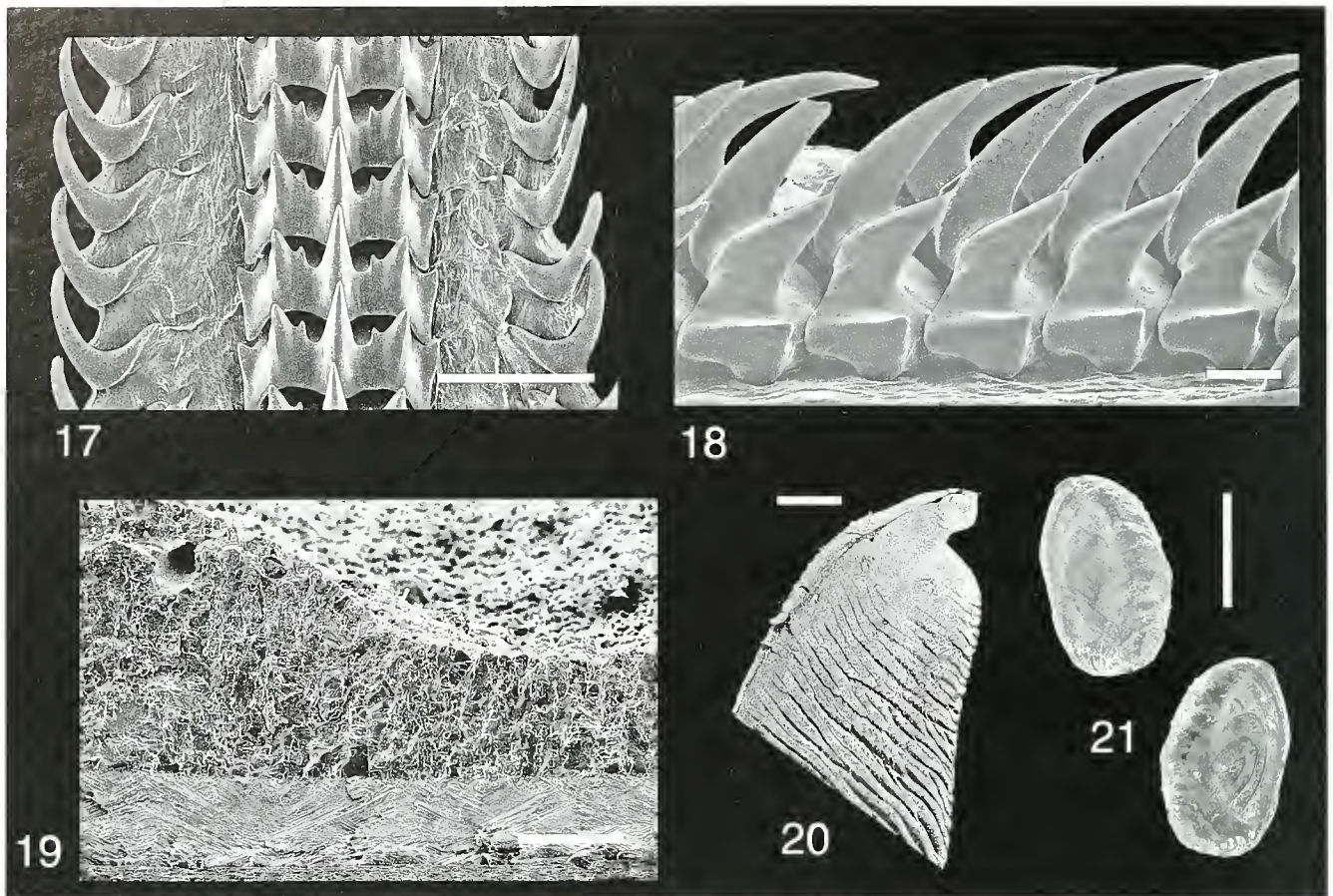
"Buccin feuilleté" Knorr, 1770: 53, pl. 30, fig. 2.

Buccinum geversianum Pallas, 1774: 33, pl. 3, figs. 1, 2.

Buccinum foliaceum multifarium frondosum Chemnitz, 1780: 130, pl. 139, fig. 1297 [non-binominal, rejected by Opinion 184 (ICZN, 1944) [Lectotype of *Murex magellanicus* Gmelin, 1791 (Beu, 1978)].



Figures 1–16. *Trophon geversianus* (Pallas, 1774). 1–3. MACN-In 36036, Punta Cavendish, Puerto Deseado, Santa Cruz province in 5 m. 4–5. MACN-In 36042, Cueva del Indio, Puerto Deseado. 6–9. MACN-In 36041, Sierra Grande, Río Negro province, in tide pools. 10–11. MACN-In 36037, Punta Peñas, San Julián, Santa Cruz Province in 2 m. 12. MACN-In 36043, Bahía Almanza, Puerto Harberton, Tierra del Fuego, in 3 m. 13–14. MACN-In 36038, both specimens from Playa La Mina, San Julián, Santa Cruz Province intertidal. Scale bar for all shells = 1 cm. 15–16. Two views of protoconch, arrow head the transition to teleoconch. Scale bar = 500 μ m.



Figures 17–21. *Trophon geversianus* (Pallas, 1774). **17.** Radula, frontal view. Scale bar = 100 μm . **18.** Lateral view of the same radula. Scale bar = 30 μm . **19.** Ultrastructure of the shell. Scale bar = 100 μm . **20.** Penis, critical-point dried. Scale bar = 800 μm . **21.** two views of the operculum. Scale bar = 1 cm.

Buccinum fimbriatum Martyn, 1754: fig. 6.

Murex magellanicus Gmelin, 1791: 354S *partim* (var. β excl.);
d'Orbigny 1841: 451; Wood, 1828: 127, pl. 26, fig. 90;
Hanley, 1856: 132, pl. 26, fig. 90.

Neptunca foliacea Röding, 1798: 116.

?*Murex ventricosus* Molina, 1810: 178.

Polyplex bulbosa Perry, 1811: pl. 9, fig. 5.

Murex foliatus Schumacher, 1817: 215, *sensu* Vokes 1971.

Fusus magellanicus Lamarck, Gray, 1839: 118.

?*Murex varians* d'Orbigny, 1839: pl. 42, figs. 4–7; d'Orbigny,
1841:452.

T. geversianus Pallas.—Montfort, 1810: 483, fig.; H. and A.
Adams, 1853: 77, pl. 8, fig. 3 c.; Tapparone-Canefri, 1874:
15; Kobelt, 1878: 205, pl. 72, fig. 1–3; pl. 73, fig. 1; Sowerby II, 1880: pl. 404, figs. 7, 8; Tryon, 1880: 144, pl. 32,
figs. 337–340, 343–347; pl. 70, figs. 433; Watson, 1886:
164; Rochebrune and Mabilie, 1889: II.53; Strebel, 1904:
173, pl. 4, figs. 11–23; pl. 5, figs. 24–42; pl. 6, figs. 43–52;
Lamy, 1906: 3; Ihering, 1907: 404; Melvill and Standen,
1907: 106; Strebel, 1908: 37, pl. 6, figs. 94 a, b.; Carcelles,
1946: 60, figs. 1–5; 1946: 69, figs. 6a,b; 7a,b,c,d; 8; Powell,
1951: 151, fig. L. S1; N, 107; Castellanos, 1970: 76, pl. 5
fig. 2; Dell, 1971: 210; Harasewych, 1984: 13, figs. 1–3,
19–25; Vokes, 1991: 7, fig.; 1992: 3, figs 1e, d; 3e, d; Kool,
1993: 47, figs. 9–14, 30–31; Castellanos and Laudoni,
1993: 3, pl. 1 figs. 1–15, 18–21.

Fusus intermedius Hupé in Gay, 1854: 166, pl. 4, fig. 6, *non*
Cristofori and Jan, 1832 *nomen nudum*; *nec* A. J. Michelotti,
1846 *nomen nudum*; *nec* G. Michelotti, 1847;
Rochebrune and Mabilie, 1889: II.53.

F. geversianus Pallas.—Hupé in Gay, 1854: 167; Gould, 1861:
pl. 16, fig. 277 a, b.

Trophon geversianus var. *calva* Kobelt, 1878: 305, pl. 75; fig. 1.

T. geversianus var. *livata* Kobelt, 1878: 305, pl. 76, fig. 1, 2.

T. philippianus Dumker in Kobelt, 1878: 277, pl. 72, figs. 4, 5;
Melvill and Standen, 1907: 107; Powell, 1951: 152.

T. philippinarum Dumker. Sowerby II, 1880: pl. 405, fig. 21.

?*T. varians* (d'Orb.)—Carcelles, 1943: 431, figs. 1, 2, 3, 6, 7;
Castellanos, 1970: 75, pl. 5, fig. 3, 4; Vokes, 1992: 3 fig. 4c.

T. plicatus (Lightfoot).—Calvo, 1987: 135, fig. 99.

Trophon sp. Vokes 1991: 9, figs. 1–13.

Description: Shell large (up to 100 mm) and extremely variable, fusiform, subquadrate profile, chalky, whitish; protoconch of 2 whorls, smooth, cylindrical, slightly globose, slightly asymmetrical; teleoconch of 4 shouldered whorls, spire less than $\frac{1}{3}$ of total shell height. Spire angle about 50° ; suture impressed; subsutural shelf straight, aperture ovoid, interior glossy pinkish; anterior siphonal canal moderately long (half the height of aperture); umbilicus closed or deep, some specimens with a pseu-

doubilical chink; outer lip rounded, with reflected edges; inner lip curved, adpressed.

Axial ornamentation of irregular, low lamellose varices on first whorls, becoming 8–10 well-defined lamellae on last ones. Lamellae growing across entire whorl, attached to the shell, sometimes curving adaxially. Lamellae ending in shallow peripheral spine, in some specimens growing adapically.

Spiral ornamentation of about 15 cords beginning at periphery of whorls. Smooth specimens common in intertidal pools and mytilid banks. Coloration varying from creamy white to dark brown. Growth lines regularly spaced, present throughout shell. Geographic variation conspicuous from north to south and from intertidal to infralittoral specimens, expressed as a series of smooth to profusely ornamented specimens according to area of collection.

Shell ultrastructure composed of two layers; innermost layer (50% shell thickness) of colabrally aligned crossed lamellar aragonite, outer layer (50% shell thickness) with amorphous calcite.

Operculum oval, brownish, with terminal nucleus. External surface covered by concentric, irregular, growth lines. Inner surface attachment area with 3 horseshoe-shaped scars, thick glazed rim present in all specimens.

Anatomical and radular characters as described by Harasewych (1984) and Kool (1993).

Type Material: The type material upon which Pallas (1774) based *Buccinum geversianum* could not be located. It could not be found at the Zoological Institute of the Russian Academy of Sciences (ZIL) St. Petersburg, where most of the material studied by that author is housed (B. Sirenko, pers. comm.).

Additional Material Examined: 53°39' S, 70°55.5' W, 5 A, R/V HERO Cruise 702, Sta. 466, 25 April 1970, 20 m (USNM 901605); 53°39' S, 70°55.5' W, 6 A, R/V HERO Cruise 702, Sta. 473, 26 April 1970, 15–18 m (USNM 901609); 53°30'48" S, 70°50'33" W, 4 A, R/V HERO Cruise 692, Sta. 69-11, 24 April 1969, intertidal, (USNM 901604); 53°24.8' S, 69°39.2' W, 1 D, R/V HERO Cruise 702, Sta. 481, 27 April 1970, 18 m, (USNM 901605); 53°17' S, 68°13' W, 1 A, R/V HERO Cruise 712, Sta. 71-2-6, 21 April 1971, 1 m, (USNM 886739); 53°51'32" S, 70°25'52" W, 1 A, R/V HERO Cruise 692, Sta. 69-22, 13 May 1969, 2–3 m (USNM 886187); 53°37.9' S, 70°14' W, 1 D, R/V HERO Cruise 702, Sta. 486, 28 April 1970, 292–296 m (USNM 901602); 54°59' S, 64°53' W, 1 D, R/V ELTANIN Cruise 11, Sta. 970, 11 February 1964, 586–641 m (USNM 870515); 53°48.7' S, 70°24.1' W, 1 D, R/V HERO Cruise 702, Sta. 489, 29 April 1970, 13–18 m (USNM 901601); 54°27' S, 66°12' W, 2 D, R/V ELTANIN Cruise 6, Sta. 453, 21 January 1963, 31 m (USNM 901600); 53°26' S, 68°35' W, 6 A, R/V ELTANIN Cruise 21, Sta. 297, 12 January 1966, 0 m (USNM 901607); 53°35' S, 70°50' W, 1 D, 1 A, R/V ELTANIN Cruise 21, Sta. 292, 8 January 1966, 0 m (USNM 901606); 53°17' S, 68°13' W, 3 D, R/V ELTANIN Cruise 712, Sta. 71-2-6, 21 April 1971, 0–1 m (USNM 901608);

Puerto Basil Hall, Isla de los Estados, 10 A, 21 May 1971, 0–1 m (MLP 4243); Buen Suceso Bay, Tierra del Fuego, 4 A, 23 October 1941 (MLP 27218); San Julián, Punta Peñas, 6 A, 1 March 1924 (MLP 526 *partim*); Puerto Lobos, Chubut, 12 A, 2 February 1938 (MLP 2021); Puerto Golondrina, Ushuaia, 9 A, January 1962 (MLP 27201); Puerto Pirámides, Chubut, 1 A (MLP 4715); San Julián, 8 A (MLP 1583); Puerto Hoppner, Isla de los Estados, 7 A (MACN-In 22547); Punta Cavendish, Puerto Deseado, 7 A, 6 February 1961 (MACN-In 26171); Punta Cavendish, Puerto Deseado, Santa Cruz province, 5 m (MACN-In 36036); Chubut, 6 A (MACN-In 4097); Tierra del Fuego, 4 A (MACN-In 5777-1); Cueva del Indio, Puerto Deseado (MACN-In 36042); Sierra Grande, Río Negro province, in tide pools (MACN-In 36041); Punta Peñas, San Julián, Santa Cruz province, 2 m (MACN-In 36037); Playa La Mina, San Julián, Santa Cruz province intertidal (MACN-In 36038); Bahía Almanza, Puerto Harberton, Tierra del Fuego, 3 m (MACN-In 36043); San Antonio Oeste, Río Negro, intertidal, 3 A (MACN 35357); 54°47'36" S, 64°22'35" W, 1 A, R/V ELTANIN Cruise 712, Sta. 71-2-44, 24 May 1971, intertidal (USNM 881127); 54°46'12" S, 64°24'42" W, 1 A, R/V ELTANIN Cruise 712, Sta. 71-2-46, 21 May 1971, intertidal (USNM 881131); 54°45'36" S, 64°02'36" W, 1 A, R/V ELTANIN Cruise 7151, Sta. 869, 23 October 1971, intertidal (USNM 881132); 54°45'45" S, 64°09'55" W, 1 A, R/V HERO Cruise 712, Sta. 71-2-40, 21 May 1971, intertidal (USNM 881130); 54°47'48" S, 65°16' W, 1 A, R/V HERO Cruise 712, Sta. 71-2-8, 23 April 1971, intertidal (USNM 881126); 54°48', 65°14' W, 1 A, R/V HERO Cruise 712, Sta. 71-2-14, 25 April 1971, intertidal (USNM 881129); Punta Arenas, Cabeza de Mar, Chile (ANSP 101444); Ushuaia (ANSP 316762); Malvinas Is. (ANSP 277535 and 277538); Cape Fairweather, Santa Cruz province, Argentina (ANSP 78080); Straits of Magellan (ANSP 36241 and ANSP 366497); Puerto San Julián (ANSP 312324); Santa Cruz River (ANSP 101445); Puerto Gallegos (ANSP 312319); Golfo San Jorge (ANSP 178645); Puerto Madryn, Chubut (ANSP 170471); Puerto Parry, Isla de los Estados, 54°46' S, 64°23' W (ANSP 402810); mouth of Santa Cruz River (ANSP 88536); Punta Arenas (ANSP 88549); Puerto Madryn (ANSP 170474); Punta Arenas, Chile (ANSP 199711).

Distribution: *Trophon geversianus* has the widest geographic range of all species of *Trophon*, i.e., from Buenos Aires province to Burdwood Bank in the southwestern Atlantic, Tierra del Fuego and Malvinas Is., and the Magellan Strait in Chile. Literature records from around Antarctica are almost certainly wrong assignments, probably mistaking it for *Trophon nucelliformis* Oliver and Picken, 1984, *T. macquariensis* Powell, 1957, or *T. albolabratus* Smith, 1875.

Remarks: *Trophon geversianus* is the best-known species of the entire genus. The great morphological variation can be appreciated from the large number of names proposed for the different morphological variants

in this species. Zaixso (1973) and Penchaszadeh (1976) both studied the egg capsules of this species but only the latter confirmed the existence of short-lived nurse eggs in the capsules.

Trophon varians is a dubious species described by d'Orbigny from material he collected in northern Patagonia ("au sud du Rio Negro"). This species has no lamellae, weak spiral cords, and its shell is unusually thick. Houart (1998) illustrated a paralectotype (as syntype) housed in Paris and Aguirre (1993) designated and figured the lectotype (BMNH 1854.12.4.539) from 13 syntypes from the BMNH collection. According to d'Orbigny's illustration (Plate 42, figs. 4, 5) and the lectotype and the paralectotype housed in Paris, it appears that its distinctive characters are the thickness of the shell and absence of lamellae. However, despite this difference between *T. geversianus* and these primary types of *T. varians*, the rest of the paralectotypes are very similar to other thin-shelled specimens of *Trophon geversianus* usually found exposed during low tides in northern Patagonia, Golfo San Matías and around the Valdés Peninsula. The anatomy and radula of the latter are identical to those of *T. geversianus*. The specimens with heavy shells are characteristic of the mouth of Rio Negro. Nothing is known about the anatomy and radula of these heavy specimens. Perhaps these characters may prove that it is only a local variation of *Trophon geversianus*, as it was suggested originally by d'Orbigny himself (1841: 452). D'Orbigny (1841: 452; 1839, plate 42, figs. 6–7) also described and illustrated the egg-capsules from what he supposed were *T. varians*. The illustration agrees better with capsules of *Urosalpinx haneti* (Petit, 1856).

Trophon plicatus (Lightfoot, 1786)
(Figures 22–42)

Le Sabot Magellanique Favanne, 1780: 342, pl. 79, fig. 1, *nomen nudum*.

Buccinum laciniatum Martyn, 1784: fig. 42, *nomen nudum*.

Murex plicatus Lightfoot, 1786: 104.

M. lamellosus Martyn.—Gmelin, 1791: 3536; Wood and Hanley, 1856: 133, pl. 27, fig. 100.

Polyplex gracilis Perry, 1811: pl. 9, fig. 4.

Fusus laciniatus Martyn.—Reeve, 1847: spec. 14, figs. a, b, c.; Hupé in Gay, 1854: 168; Gould, 1861: pl. 16, fig. 278.

Trophon laciniatus Martini.—H. and A. Adams, 1853: 77, pl. 8, figs. 3 a, b.; Kobelt, 1878: 280, pl. 72, figs. 6, 7; Tryon, 1880: 143, pl. 31, figs. 330–332. Rochebrune and Mabile, 1889: 11:53; Strebel, 1904: 199, pl. 3, figs. 1–8; Lamy, 1906: 3; Strebel, 1908: 37; Castellanos, 1970: 74, pl. 5, fig. 1.

?*Trophon antarcticus* Philippi, 1868: 225 (sensu Tryon 1880).

T. lacineatus Martyn. Sowerby II, 1880: pl. 404, fig. 13.

T. (Stramonitrophon) laciniatus (Martyn).—Powell, 1951: 156, fig. 1, 56.

T. (Stramonitrophon) lamellosa (Gmelin).—Dell, 1971: 212.

T. plicatus (Lightfoot, 1786).—Rehder, 1967: 20; Cernohorsky, 1977: 117, fig. 18; Vokes, 1991: 7, fig.; 1991b: 9, figs. 14–16; 1992: 3, figs. 2, b, c, d.; Castellanos and Landoni, 1993: 5, figs. 16, 15, 22.

Description: Shell of medium to large size (to 50 mm), smooth, fusiform, thin, somewhat chalky; protoconch smooth of 2½ whorls; teleoconch of 6 shouldered whorls, spire less than ½ of total shell height. Spire angle about 50°; suture impressed; subsutural ramp straight, aperture small, ovoidal, interior pale brownish; anterior siphonal canal long (more than half height of the aperture), narrow, curved, open; umbilicus absent; outer lip rounded with reflected edges; inner lip curved, adpressed. Axial ornamentation of irregular, low lamellose varices in the first whorls, that become 8–10 real lamellae in the last ones. Lamellae growing over the entire whorl, but attached to the shell, sometimes curving adaxially. Lamellae ending in a peripheral spine, in some specimens growing adapically. Spiral ornamentation poorly developed to almost smooth, sometimes consisting of 6 weak cords on the base of the last whorl and the back of the siphonal channel. Regular, very weak growth lines present throughout shell.

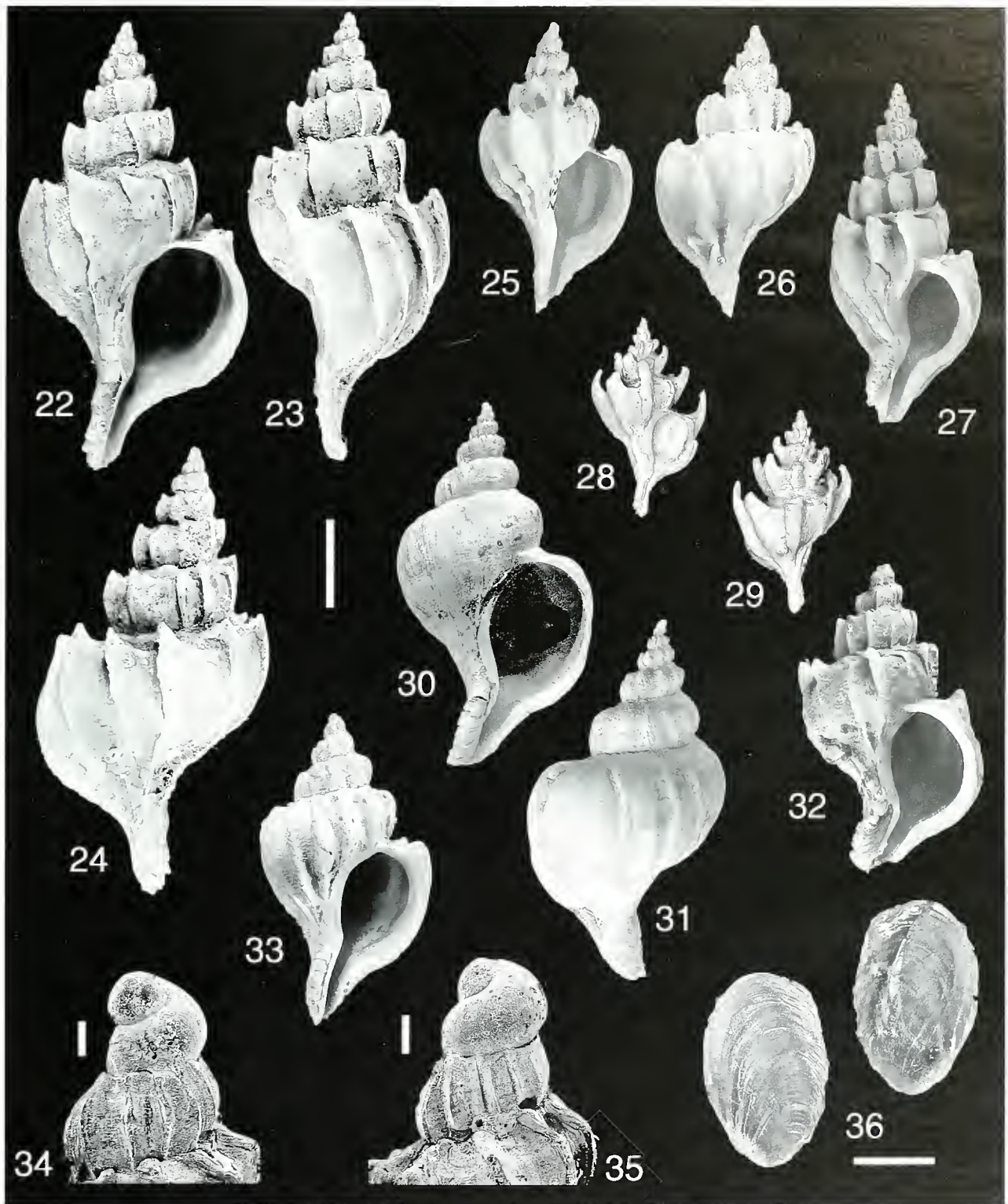
Shell ultrastructure composed of two layers; innermost layer (25% of shell thickness), composed of collaterally aligned crossed lamellar aragonite, outer layer thick (75% of shell thickness) with amorphous calcite (Figure 42).

Operculum oval, with terminal nucleus. External surface covered by concentric, irregular, growth lines. Inner surface attachment area with two or three horseshoe-shaped scars, glazed rim present in all specimens (Figure 36).

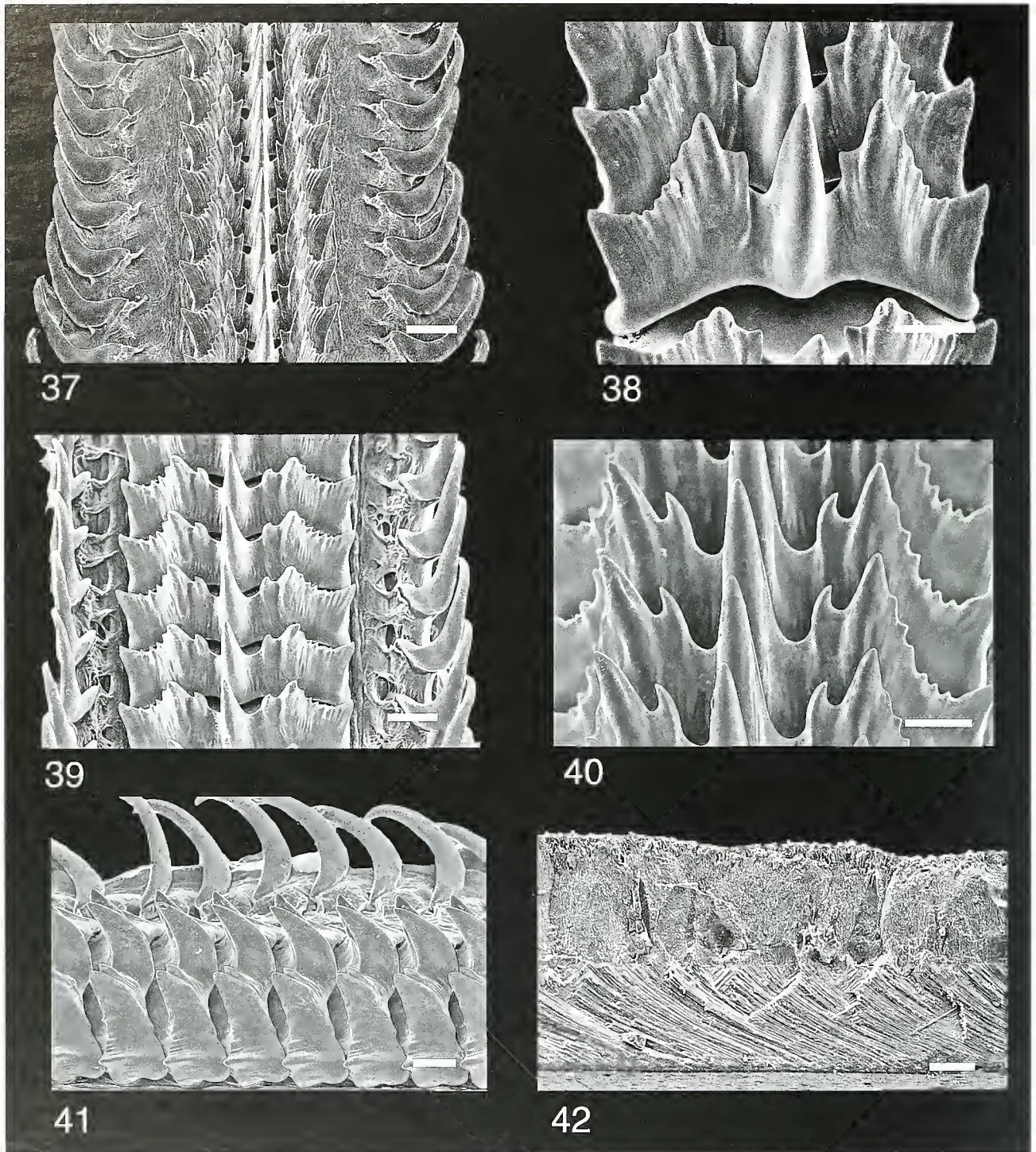
Animal of medium size relative to shell. Mantle large, mantle roof thin. Cephalic tentacles broad in basal half, flat, blunt, with rounded large black eyes in the middle; mantle edge thickened, smooth; pallial organs arranged as in other rachioglossans; brown osphradium less than half of ctenidium length, slightly asymmetrical, with 50–55 leaflets per side; ctenidium as wide as osphradium, containing triangular leaflets. Hypobranchial gland brownish and inconspicuous, rectum to the right of hypobranchial gland.

Proboscis pleuroembolic, long, broad. Radular ribbon extending beyond rear of buccal mass, long (0.69 × aperture height vs. 0.78 × aperture height in *Trophon geversianus*). Esophagus loops beneath buccal mass, where esophagus receives embedded ducts of salivary glands anterior to a small Leiblein valve. Esophagus curving distinctly and running along entire side of gland of Leiblein. Esophageal glands ("*Clandule framboise*") whitish in color, posterior to nerve ring slightly marked on the external side of the esophagus. Large salivary glands enveloping Leiblein valve and accessory salivary glands. Accessory salivary glands distinctly large, sometimes dark-colored, tubular, compact, coiled, embedded in salivary glands. Gland of Leiblein conspicuous, brown, ending in a medium size blind duct and very small ampulla.

Radula rachioglossan with rachidian teeth wide (~150 µm), central cusp thin, large; lateral cusps wider and slightly shorter than central cusp, with inner edge straight; with sharp straight denticle in upper third of internal edge of lateral cusp, external edge with 6 very



Figures 22–36. *Trophon plicatus* (Lightfoot, 1786). **22–24.** MACN-In 36033, Bahía Ensenada, Ushuaia, Tierra del Fuego, Argentina. **25–26.** MACN-In 9032-16, Comodoro Rivadavia, Chubut province, Argentina. **27.** BMNH 19990384, 45°55.219' S, 73°39.522' W, intertidal, Islet NE shore of Isla Huemules, Golfo Elefantes, Chile. **28–29.** AK 133035, Station WS788 Discovery, 45°07' S, 65°W. **30–31.** MACN-In 36034, Punta Peñas, San Julián, Santa Cruz province, Argentina. **32.** Same lot as Figure 6. **33.** MLP 27202, Bahía Golondrina, Ushuaia, Tierra del Fuego. **34–35.** Two protoconchs, scale bars = 400 μ m. **34.** USNM 870535, 52°30' S, 67°14' W, in 52 m. **35.** USNM 901620, 53°35' S, 69°45' W, 1 D, R/V HERO Cruise 692, Sta. 404, 37–46 m. **36.** MLP 27232, operculum, external (left) and internal (right) views, scale bar = 1 cm. Scale bar for all shells = 1 cm.



Figures 37–42. *Trophon plicatus* (Lightfoot, 1786). 37. MLP 27232, Dorsal view of radular ribbon. Scale bar = 50 μm . 38. MLP 526, San Julián, Punta Peñas, 1 March 1924, rachidian teeth. Scale bar = 30 μm . 39. Variations of rachidian teeth, Rocamora, Ushuaia, 1 A. 8–10 m (MACN-In 36053). Scale bar = 30 μm . 40. MLP 27202, Bahía Golondrina, Ushuaia, Tierra del Fuego, Argentina, detail of the rachidian teeth. Scale bar = 20 μm . 41. Same specimen as 40, lateral view of rachidian teeth, scale bar = 30 μm . 42. USNM 570535, 52°30' S, 67°14' W, in 52 m, shell ultrastructure, fracture surface commarginal. Scale bar = 30 μm .

well defined denticles, always present. Base of rachidian tooth sinuous, sliding beneath base of next tooth. Marginal area with single conspicuous cusp. Lateral teeth with single, long and narrow cusp, slightly attached basal plate. Cusps of rachidian teeth pyramid-like in lateral view (Figures 3S–4O).

Male and female organs as in *Trophon geversianus* (see Harasewych, 1984).

Type Locality: Islas Malvinas.

Type Material: Probably lost. According to Dance (1966) part of the material from the Portland Catalogue is in London (BMNH), however this is not the case of *T. plicatus*.

Additional Material Examined: 52°30' S, 67°14' W, 2 D, R/V ELTANIN Cruise II, Sta. 980, 14 February 1964, 82 m (USNM 870535); 53°35' S, 69°45' W, 1 D, R/V HERO Cruise 692, Sta. 404, 37–46 m (USNM 901620); 52°56' S, 75°00' W, 1 D, R/V ELTANIN Cruise II, Sta. 958, 5 February 1964, 92–101 m (USNM 870423); 53°06' S, 67°04' W, 3 D, R/V HERO Cruise 702, Sta. 450, 5 March 1970, 86 m (USNM 901622); 53°39'24" S, 70°55'30" W, 1 D, R/V HERO Cruise 702, Sta. 467, 25 April 1970, 24 m (USNM 901623); 52°35' S, 65°08' W, 1 D, R/V ELTANIN Cruise II, Sta. 976, 13 February 1974, 128 m (USNM 870525); 46°04' S, 83°55' W, 1 A, R/V ELTANIN Cruise 25, Sta. 326 9 October 1966, 298 m (USNM 901621); 53°48.7' S, 70°24.1' W, 1 D, R/V HERO Cruise 702, Sta. 489, 29 April 1970, 13–18 m (USNM 901624); 53°32' S, 64°57' W, 2 A, R/V ELTANIN Cruise II, Sta. 974, 12 February 1964, 119–124 m (USNM 881960); 53°39' S, 70°55.5' W, 1 A, R/V HERO Cruise 702, Sta. 466, 20 m (USNM 901754); Bahía Golondrina, Ushuaia, 1 A, (MLP 27202); Rocamora, Ushuaia, 1 A, 8–10 m (MACN-In 36053); Bahía Ensenada, Ushuaia, Tierra del Fuego, (MACN-In 36033); 45°07' S, 65°W, 1 A, Discovery Station WS788, 13 December 1931, 82–88 m (AK 133035) illustrated in figs. 25–29; Comodoro Rivadavia, 17 D (MACN-In 9032-16); 54°34' S, 64°00'18" W, 1 D, 1 A, R/V HERO Cruise 715, Sta. 870, 24 October 1971, 84 m (USNM 881128); Bahía Buen Suceso, 1 A, 23 October 1941, (MLP27230); Cabo Colnett, Isla de los Estados, 1 A, R/V HERO Cruise 712, Sta. 553, 20 October 1971, 91 m (USNM 869720); 2 D, 75 m (USNM 96176); Orange Harbor (USNM 5676); Paso Richmond, Tierra del Fuego 55 m, (MACN-In 24940); 55°7' S, 66°33' W, 82 m (MACN-In 23938); Tierra del Fuego (MACN-In 5240-2); Punta Peñas, San Julián, Santa Cruz province, Argentina, 4 A (MLP 27232); Punta Peñas, San Julián, Santa Cruz, Argentina, 1 A (MLP 27212); Puerto San Julián, Santa Cruz province, Argentina (49°15' S, 67°39' W), 4 A, 2–3 m (MACN-In 36034); 45°55.219' S, 73°39.522' W intertidal, Islet NE shore of Isla Huemules, Golfo Elefantes, Chile (BMNH 19990384).

Distribution: This is a typical species from the Magellanic province. It has been recorded from Peninsula

Valdés to Tierra del Fuego in Argentina and Chile to 49°S in the north (Reid and Osorio, 2000).

Remarks: The authorship of the name according to Dance (1962) and Rehder (1967) should be credited to J. Lightfoot, the anonymous compiler of the "Catalogue" where the name was used for the first time, not to Solander.

There is an interesting range of conchological variation in *Trophon plicatus*, from almost smooth specimens to highly lamellate. However, the profile is always slender. *Trophon bahamondei* McLean and Andrade, 1982, is a morphologically similar species, with peripheral spines and shallow lamellae. On the other hand, *T. bahamondei* has no spiral ornamentation and *Trophon plicatus* has 6 weak cords on the base of the last whorl and the back of the siphonal canal.

The gross anatomy is that customary for most Patagonian Trophoninae. However, a distinctive anatomical feature is the morphology of the accessory salivary glands, which are compact, tubular, somewhat coiled and large, and completely embedded in the salivary glands. Most Patagonian Trophoninae (e.g., *T. bahamondei* as well as *T. geversianus*), have small, kidney-shaped, accessory salivary glands.

Radular features of *T. plicatus* are clearly different from *T. bahamondei* (see Figures 26–27). The latter has a distinctive small cusp on the outer margin of the lateral cusp on the rachidian teeth. In addition, the rachidian base is thinner and wider.

Trophon antarcticus Philippi, 1868, is probably a synonym according to Tryon (1880); however, the type material is missing and the description is rather obscure.

Powell (1951) described the subgenus *Stramonitrophon* to include only *T. plicatus* [(as *T. laciniatus* Martyn, *nomen nudum* rejected by Opinion 456 (ICZN, 1957)] a species with *Stramonita*-like radula, i.e., rachidian teeth with three cusps, where the marginal side of the lateral cusps bears several denticles. This radula illustrated by Powell (1951: 194, fig. L, 86) was dissected from the specimen illustrated in figs. 28–29. The radular morphology of *T. plicatus* is different from that of *T. geversianus*. However, *Coronium coronatum* (Penna-Neime and Leme, 1978) and *T. acanthodes* Watson, 1882, bear the same denticles on the lateral cusps of the rachidian teeth. This appears to be a common feature in several Trophoninae from the southwestern Atlantic.

The shell of *Trophon iarae* Houart, 1998, shows some similarity with some specimens of *T. plicatus*. It was based on only two specimens collected by fishing boats apparently from Brazil and off Uruguay. The anatomy and soft parts of *T. iarae* remain unknown. The radula apparently has been illustrated by Calvo, 1987 (although according to Houart, 1998: 127, there is no certainty about the identity of the specimen from where this radula was taken). In any event, this illustration does not allow for a detailed comparison with other species. Further comments about the validity of this species or its

affinity with other species of *Trophon* mostly depends on anatomical data which are not available.

Houart (1998: 127) mentioned the specimen of *T. plicatus* illustrated by Cernohorsky (1977) from Lively Is. (Malvinas Is.) as belonging to his new species, *T. iarae*. However, Cernohorsky's specimen could be easily included in the range of geographic distribution and morphological variation of *T. plicatus*. He also illustrated two specimens of *T. patagonicus* as *T. plicatus* (Figures 8–10 in Houart, 1998).

Trophon patagonicus (d'Orbigny, 1839)
(Figures 43–65)

Murex patagonicus d'Orbigny, 1839: pl. 62, figs. 2–3; 1941: 452
non *Fusus patagonicus* Sowerby, 1846 (= *Trophon*).

Trophon necocheanus Ihering, 1907: 404, pl. 16, fig. 106.

Trophon laciniatus (Martyn).—Carcelles, 1946: 70–72, figs. 6
a, b, 7 a–d, 8.

Trophon plicatus (Lightfoot, 1786).—Rios, 1955: 88, pl. 31, fig.
386; 1994: 114, pl. 37, fig. 483; Houart, 1998: 130, figs.
8–10 non Lightfoot, 1786.

Description: Shell large (up to 72 mm), biconic, heavy, chalky or glossy white, sometimes brownish grey, opaque; protoconch smooth of $2\frac{1}{4}$ ($\sim 2.0 \times 1.5$ mm) asymmetrical whorls; transition to teleoconch well defined; teleoconch of 7 shouldered whorls, spire less than $\frac{1}{2}$ of total shell height. Spire angle about 70° ; suture impressed; aperture oval, interior glossy white; anterior siphonal canal rather long for the genus (half height of aperture), narrow, open; pseudumbilicus deep and widely open; outer lip reflexed. Axial ornamentation of irregular strong, sharp lamellae covering entire whorl surface, numbering 9–12 in the last whorl. Continuum of morphologies present from completely smooth shells with no axial ornamentation (Figures 53–56), to some incipient lamellae along peripheral keel (Figures 48–50), to strongly developed lamellae (Figures 43–45). Spiral ornamentation missing, except on first teleoconch whorl which bears 3–4 invariably present spiral cords (Figures 62–63). Irregular growth lines present throughout shell surface. Some uncommon specimens have about three weak greenish or dark spiral lines on the last three or four whorls.

Shell ultrastructure arranged invariably of two layers; innermost layer (25% shell thickness), composed of crossed lamellar aragonite, outer layer very thick (75% shell thickness) of amorphous calcite (Figure 61).

Operculum oval, with terminal nucleus. External surface covered by concentric, irregular, growth lines. Inner surface attachment area with two or three horseshoe-shape scars.

Rachiglossan radula with rachidian teeth distinct, central cusp thin, large; lateral cusps slightly shorter than central cusp, sharp straight denticle in the upper third of the internal edge of the lateral cusp, external edge of lateral cusps smooth. Base of rachidian tooth sinuous, sliding beneath base of next tooth. Marginal area with single conspicuous cusp. Lateral teeth with single, long

and narrow cusp, attached to basal plate (Figures 64–65).

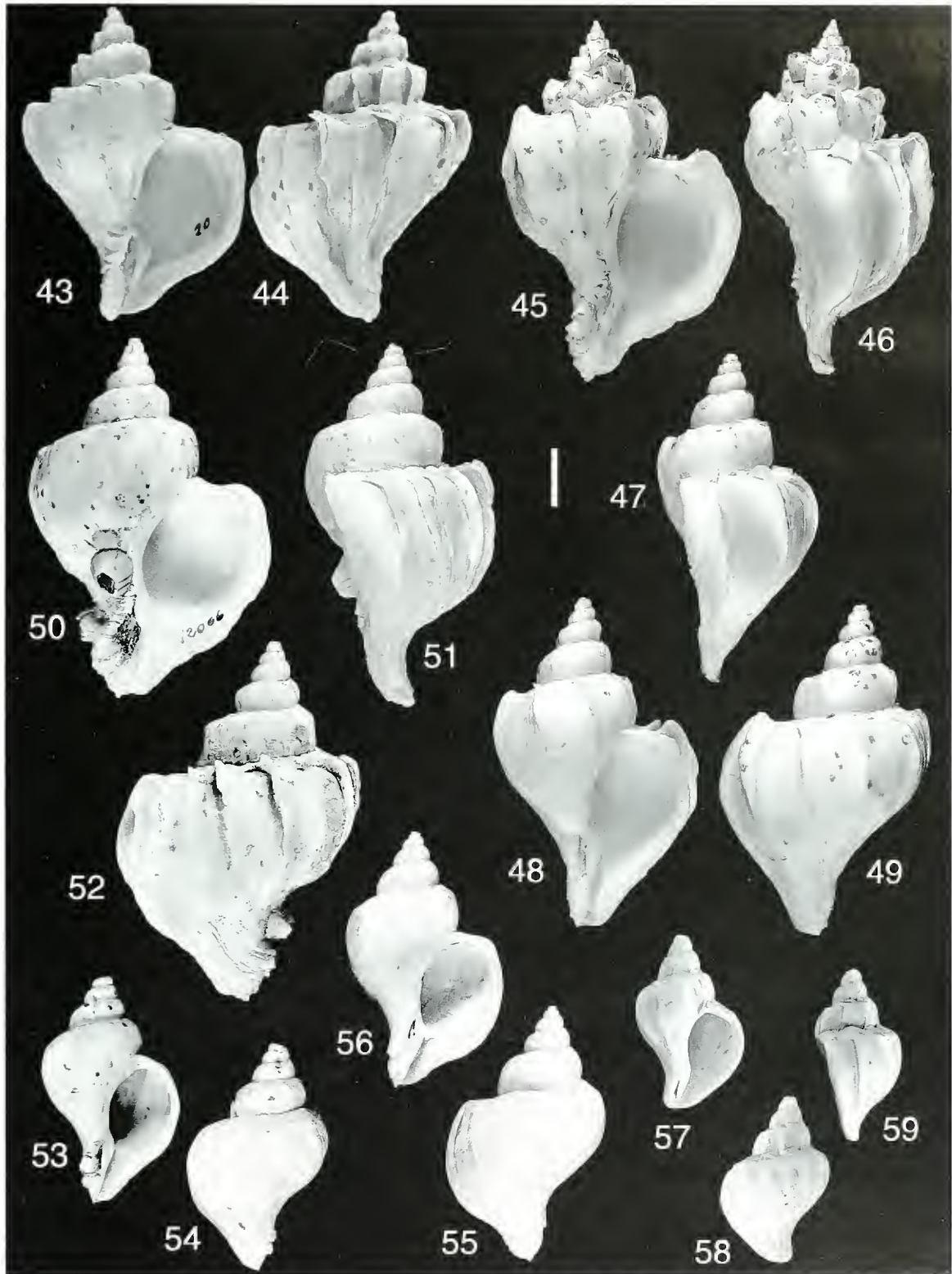
Penchaszadeh (1976) described the egg capsules of *T. patagonicus* [identified as *T. laciniatus* (Martyn) and *T. varians* (d'Orbigny)].

Type Material: Four syntypes are housed in the Natural History Museum, London under the number 1854.12.4.538, from “Baie de San Blas, Patagonie”. One of them is herein illustrated (Figures 43, 44).

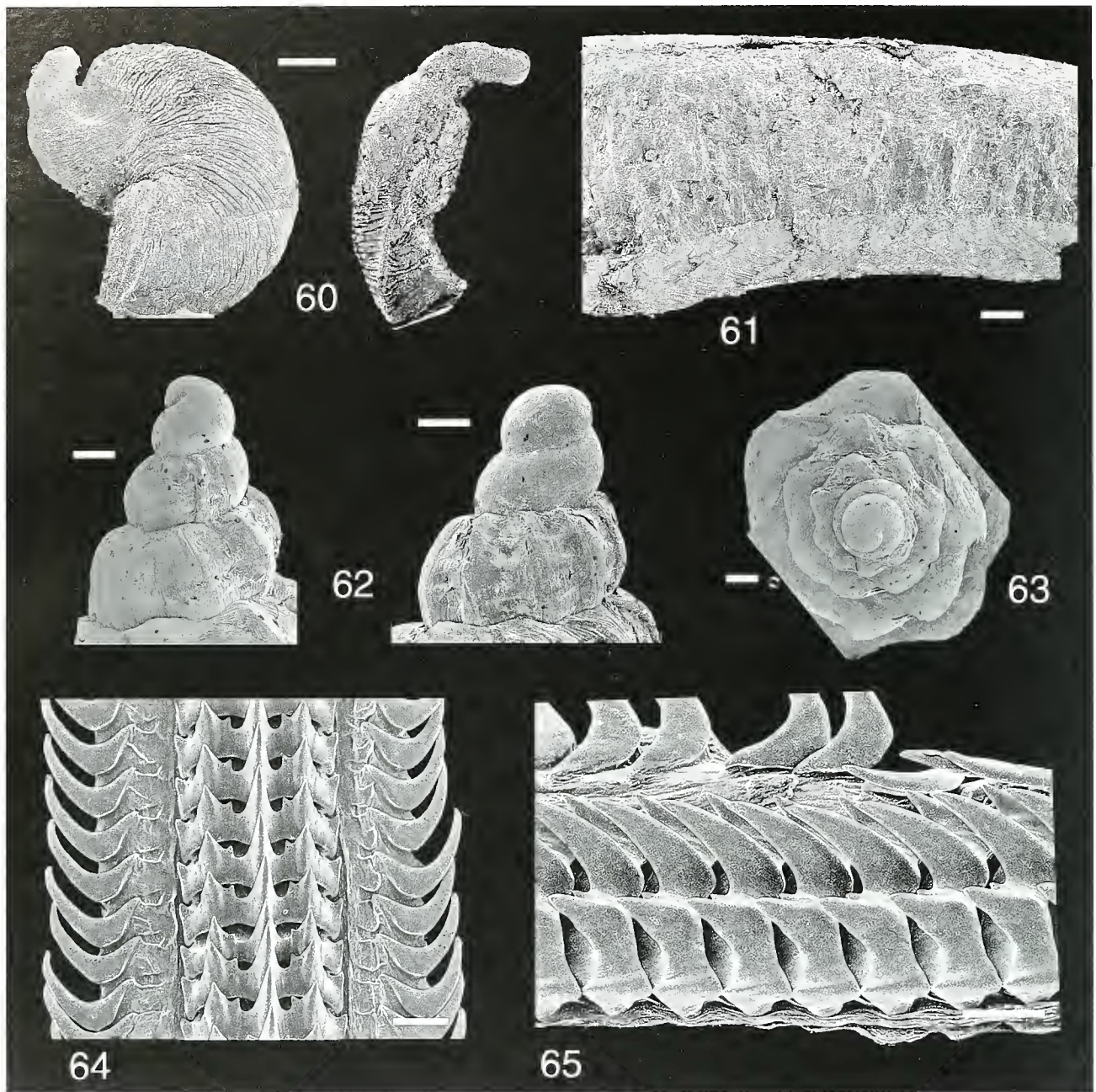
Additional Material Examined: Puerto Quequén, Buenos Aires province, 3 A (MLP 26309); Miramar, Buenos Aires province, 1 A, 1 D (MLP 417); Necochea, Buenos Aires province, 3 A, 30 m (AMNH 173640); Necochea, 1 A, 30 m (AMNH 181220); Puerto Quequén (ANSP 236034 and 236032); 18 miles off Puerto Quequén, 4 D (MACN-In 20441); $37^\circ 20' S$, $56^\circ 50' W$, 4 D, 55 m (MACN-In 15104); Mar del Plata, Buenos Aires province, Argentina (MACN-In 10289; 12902; 2 D, 45 m, 9361-51; 7 D, 11374; 11587; 11587-1; 4 D, 10249; 10320; 2 D, 10742; 11118; 3 D, 12066; 3 A, 25775; 9361-53; 5 D, 10290; 10190; 10248; 12216); $36^\circ 25' S$, $54^\circ 38' W$, 54 m, 1 D (MACN-In 23426); $34^\circ 40' S$, $52^\circ 18' W$, 1 A, 100 m (MACN-In 23491); Fondos de Querandí, Buenos Aires province, 5 A (MACN-In 14334); 25 miles off Puerto Quequén, 22 D (MACN-In 21138); Fondos de Querandí, 1 D (MACN-In 25774); Necochea, 2 D, 40–50 m (USNM 710024); Mar del Plata, 4 D, 1 D (USNM 568240; USNM 346826); off Necochea, 1 A, 30 m (USNM 876123, Bledsoe collection); Mar del Plata, 1 D (USNM 363768); Uruguay, 1 D (USNM 346786); 1 D, $36^\circ 30' S$, $54^\circ 44' W$, 26 m (MACN-In 24259).

Distribution: This species is common on the mussel banks off southern Uruguay and Buenos Aires province in depths of 25–40 m.

Remarks: *Trophon patagonicus* is a variable species, endemic to the littoral of Buenos Aires province and the Uruguayan coast. The species has had quite a confusing taxonomic history. Those specimens with well-developed lamellae have been usually identified as *T. plicatus*, and those with smooth shells and no ornamentation as *T. geversianus* or *T. varians*. Specimens collected on the same location were identified as two different species according to the presence or absence of lamellae. However, some specimens (Figures 50–52) are clearly intermediate forms, and no other anatomical feature seems to separate them. There is no reason to consider them as two different species. The whole lot of specimens studied by Carcelles (1946) shows clearly that he confused d'Orbigny's species with *T. plicatus*. Such a mistake was also made by Rios (1955, 1994) and several other authors. *Trophon plicatus* is a typical magellanic species with a thinner and more cylindrical profile, medium size (never reaching more than 50 mm high). Specimens of *T. plicatus* here identified were never collected at latitudes north of $45^\circ S$. Its protoconch is always smooth and with fewer whorls, and the lamellae along the keel usually develop into strong triangular projec-



Figures 43–59. *Trophon patagonicus* (d'Orbigny, 1839). 43–44. Syntype BMNH IS54.12.4.535, Bahía San Blas, Argentina. 45–46. MACN-In 36040, Puerto Quequén, Buenos Aires. 47–49. MLP 417, Miramar, Buenos Aires, in 54 m. 50–52. MACN-In 12066, Mar del Plata, Buenos Aires. 53–56. MACN-In 36031, Puerto Quequén. 57–59. MACN-In 21047, “Carmen de Patagones?”. Buenos Aires. Scale bar for all figures = 1 cm.



Figures 60–65. *Trophon patagonicus* (d'Orbigny, 1839). **60.** Penis, critical-point dried. Lateral and frontal view. Scale bar = 1000 μm . **61.** Shell ultrastructure, fracture surface commarginal. Scale bar = 300 μm . **62–63.** MACN-In 11374, protoconch, three views, Mar del Plata, Buenos Aires province. Scale bar for all figures = 600 μm . **64.** Dorsal view of radular ribbon. Scale bar = 50 μm . **65.** Lateral view of radularian teeth. Scale bar = 50 μm .

tions approximately parallel to the coiling axis. The aperture is larger and subcircular in *T. patagonicus*, very different from the smaller and almost circular one on *T. plicatus*. *Trophon geversianus* usually has strong spiral ornamentation on the entire shell surface, a feature also observed in *T. varians*.

Ihering (1907) described *T. necocheanus* based on (Quaternary?) specimens collected at Necochea, Buenos Aires province, Carmen de Patagones, Buenos Aires

province, and Sierra Laziari, Santa Cruz province ("Formation araucanienne"). Most of the type material is lost, but the remaining types fall within the range of variation of *T. patagonicus*. One of the specimens, from a lot of three, with uncertain locality (MACN-In 21047, relabeled "Carmen de Patagones?") is here illustrated (Figures 57, 59). This specimen was acquired through an exchange with Museu Paulista, São Paulo, Brazil (where Ihering worked for most of his professional life) and is

part of the original type series. All of the specimens fit well in the original description of *T. patagonicus* and there is no doubt that is the same species described by d'Orbigny.

Sowerby II (2nd of name) described in 1846 *Fusus patagonicus* from the Tertiary of San Julián (Santa Cruz province, Argentina), a species that clearly belongs in *Trophon*. Therefore, as the two species are quite distinct, d'Orbigny's name has priority over Sowerby's (Griffin and Pastorino, 2005).

Trophon acanthodes Watson, 1882
(Figures 66–78)

Trophon acanthodes Watson, 1882: 356; 1886: 166, pl. 10, fig. 6; Cernohorsky, 1977: 112, fig. 9 (holotype); Pain, 1980: 8, fig.; Rios, 1985: SS, pl. 31, fig. 388; Castellanos, 1986: 22, fig.; Castellanos and Landoni, 1993: 8, pl. 2, fig. 28.

Fusus acanthodes (Watson).—Carcelles, 1947: 12, pl. 2, figs. 1, 2; pl. 3, figs. 3, 4 (not figs. 5, 6 which is *Coronium coronatum*).

Pagodula acanthodes (Watson).—Kaicher, 1980: fig. 2599.
"Fusinus" *acanthodes* (Watson).—Calvo, 1987: 153, fig. 127.
"Trophon" *acanthodes* Watson.—Rios, 1994: 37, pl. 37, fig. 486.

Description: Shell large, about 125 mm high, thick, slender in profile, chalky white; protoconch worn in all specimens; teleoconch of 7 shouldered whorls; spire less than 1/3 of total shell height. Spire angle about 45°; suture impressed, subsutural shelf oblique, somewhat convex, aperture small, subcircular, interior glossy white; anterior siphonal canal very long (longer than aperture height) deep, straight or curved, always open; outer lip rather reflected, rounded, inner lip adpressed. Axial ornamentation of 12–15 regularly spaced, axial lamellae, slightly raised, almost attached along the entire whorl, producing open, conspicuous, regularly spaced spines at periphery; spines becoming more closely packed on last whorl. Spiral ornamentation of 4–5 weak rounded threads on the lower part of the first whorls, becoming more than 20 in last one. Growth lines present throughout shell, producing wrinkly surface by intersection with spirals.

Operculum elliptical, nucleus terminal, older specimens tear-shaped. External surface covered by concentric, irregular, growth lines. Inner surface with a conspicuous marginal rim; attachment area covering almost the whole operculum but the rim; horseshoe-shaped scars present.

Rachidian teeth wide (~130 μm), central cusp large; lateral cusps wider and shorter than central cusp, inner edge with an almost obsolete denticle (particularly in adult specimens), external edge with 5–6 denticles decreasing in size towards the edge. Base of rachidian tooth curved, somewhat sinuous, sliding beneath base of next tooth. Marginal area with single cusp. Lateral teeth with single, long cusp, slightly attached basal plate.

Shell ultrastructure composed of two layers: innermost layer (55% of total thickness of shell) composed of crossed lamellar aragonite, outer layer (45%) of amorphous calcite.

Animal as in other *Trophon* species but with some size differences. Tentacles long and well defined, joined at base; eyes deeply marked. Salivary and accessory salivary glands as in *T. plicatus*. Osphradium a bit more than one third of ctenidium length, asymmetrical, with about 112 leaflets, ctenidium with about 250 leaflets twice as large as osphradium. Typical pleurocymbolic proboscis, shorter than in *T. geversianus*, valve of Leiblein also smaller; gland of Leiblein large with a long blind duct. Radula long; digestive tract with the usual loop on the left side of the gland of Leiblein, before the duct to the gland.

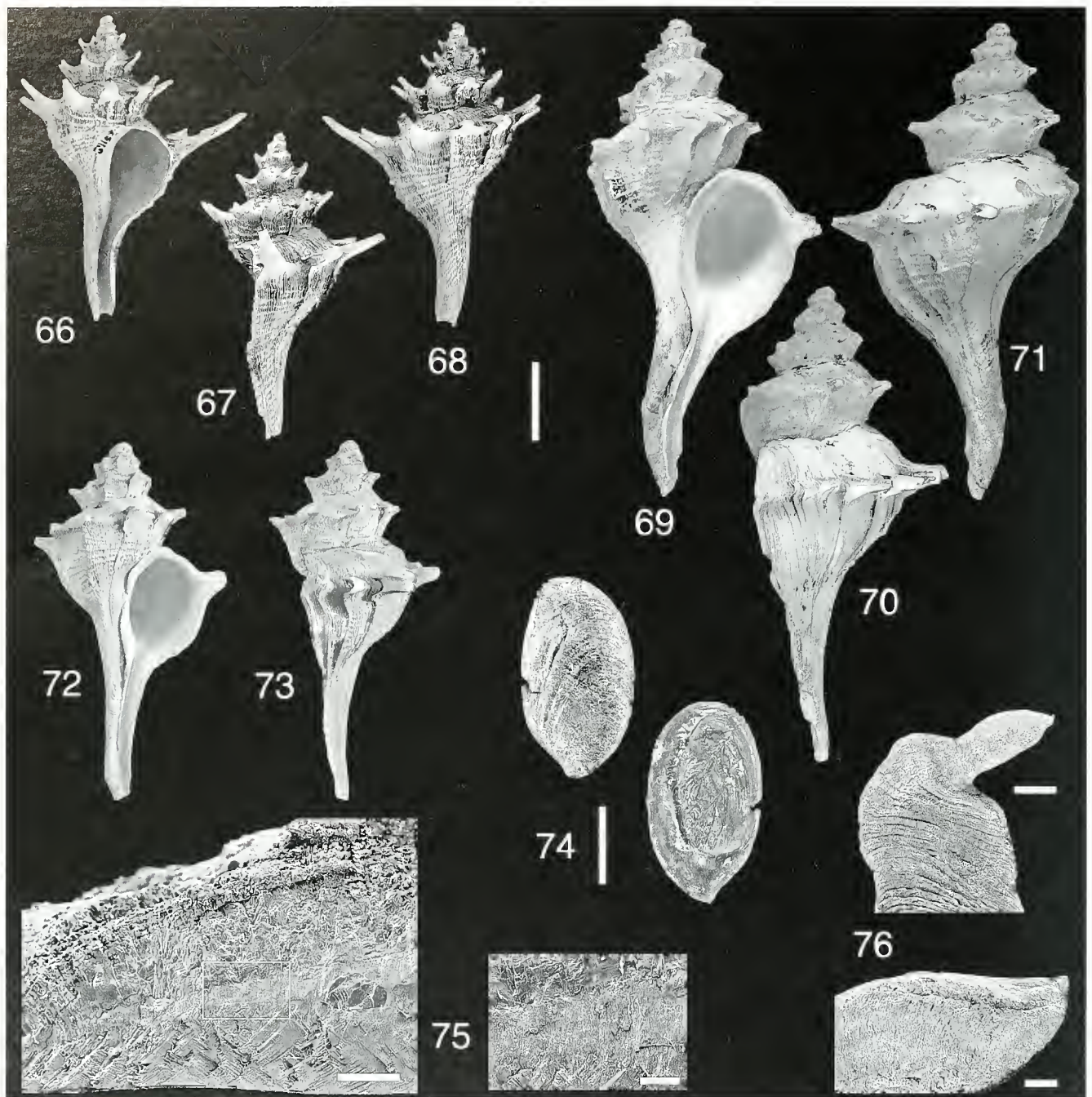
Male and female organs similar to *T. geversianus*.

Type Material: BMNH 1887.2.9.568, holotype 50°S'30' S, 74°41' W, 229 m (illustrated by Cernohorsky, 1977, fig. 9).

Additional Material Examined: 52°53' S, 74°05' W, 3 D, R/V ELTANIN Cruise 23, Sta. 1605, 1 April 1966, 522–544 m (USNM 901756); off Mar del Plata, 5 A, January 1962 (MLP 26283); 52°41' S, 74°35' W, 1 D, R/V ELTANIN Cruise 21, Sta. 290, 6 January 1966, 188–247 m (USNM 870115); 51°56' S, 56°39' W, 1 D, R/V ELTANIN Cruise 7, Sta. 557, 14 March 1963, 855–866 m (USNM 870345); 52°52' S, 75°18' W, 1 D, R/V ELTANIN Cruise 21, Sta. 288, 119–329 m (USNM 901758); 52°51' S, 74°13' W, 1 D, R/V ELTANIN Cruise 21, Sta. 291, 523–539 m (USNM 901757); 52°53' S, 74°05' W, 2 D, R/V ELTANIN Cruise 23, Sta. 1605, 1 April 1966, 522–544 m (USNM 897615); 40°15' S, 57°40' W, 1 A (MACN 18425); 40°03' S, 57°00' W, 1 D, 50 fathoms (91.5 m) (MACN 15699); 30 miles off Mar del Plata (ANSP 262989 and 236028); off Mar del Plata, 1 A, 2 D (MACN 17671 and 16449); 39°26' S, 56°40' W, 1 A, 1 D, 90 m (MACN 17040); 39°02' S, 56°46' W, 1 A, 1 D; East of Punta Médanos (39°–39°30' S), 4 D, 50 fathoms (91.5 m) (MACN 14386); 39°55' S, 57°50' W, 1 D, 51 fathoms (93 m); 38°25' S, 56°30' W, 3 D (MACN 16798); 39°35' S, 57°10' W, 1 A, 1 D (MACN 18342); 39°50' S, 57°18' W, 4 A, 52 fathoms (95 m) (MACN 21741); 39°00' S, 57°10' W, 2 D, 45 fathoms (82 m) (MACN 15216); 37°15' S, 54°50' W, 1 A, R/V ALDEBARAN, March 2000, commercial otter trawl, 111 m (MACN-In 36032); 36°37' S, 54°14' W, 1 A, R/V ALDEBARAN, March 2000, otter trawl, 104 m (MACN-In 36031); 39°02', 57°02' W, 2 D, 46 fathoms (84.1 m) (MACN-In 25118); 37°35' S, 54°55' W, 1 D, 105 fathoms (192 m) (MACN-In 25165-2).

Distribution: Off Rio Grande do Sul state in Brazil (Rios, 1994), Uruguay, to Tierra del Fuego, Argentina.

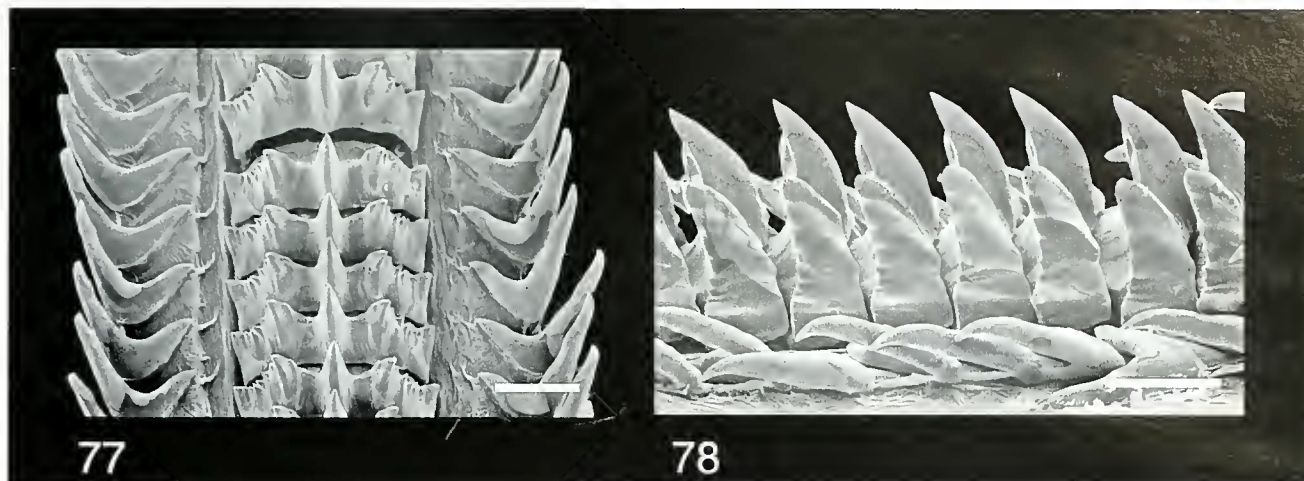
Remarks: The shell of *Trophon acanthodes* is somewhat similar to that of *Coronium coronatum*, which in fact could be granted that generic position. The operculum and the radula are different in both species. The operculum is somewhat triangular in *Coronium* with a weak rim instead of the characteristic thicker one of the *Trophon* species. The radula of *Trophon acanthodes* presents the intermediate cusp between the central and the lateral



Figures 66–76. *Trophon acanthodes* Watson, 1882. **66–68.** MACN-In 25118, 39°02' S, 57°02' W, 46 fathoms (84.1 m). **69–71.** MACN-In 36031, 37°15' S, 54°50' W in 111 m. **72–73.** MLP 26283, Mar del Plata. Scale bar for all shells = 1 cm. **74.** Two views of the operculum of the specimen in Figures 69–71. Scale bar = 1 cm. **75.** Ultrastructure of the shell. Scale bar = 200 μm; detail, large quadrangle. Scale bar = 50 μm. **76.** Penis, critical-point dried (scale bar = 600 μm) with detail of the efferent conduct (scale bar = 150 μm).

one of the rachidian teeth almost obsolete, while in *Coronium coronatum* it is very conspicuous. Castellanos (1986) drew a stereotyped radula of *T. acanthodes* where denticles are wrongly placed on the margin of the rachidian tooth instead of the inner edge of the lateral cusp.

The protoconch in *Coronium* is multispiral and extremely pointed, distinctive of the genus. All the studied specimens of *T. acanthodes* are worn; however, some of them show the sinuated line of a typical *Trophon* protoconch.



Figures 77–78. *Trophon acanthodes* Watson, 1882. **77.** MLP 26283, off Mar del Plata Radula of a large specimen, frontal view. Scale bar = 50 μm . **78.** Lateral view. Scale bar = 50 μm .

Trophon pelseneeri Smith, 1915
(Figures 79–93)

Trophon pelseneeri Smith, 1915: 92, pl. 2, figs. 6, 7; Rios, 1994: 115, pl. 3S, fig. 484; Houart, 1991: 33.

Trophon sp.—Carcelles, 1944: 253.

Trophon orbignyi Carcelles, 1946: 81, pl. 12; Castellanos, 1970: 73, pl. 5, fig. 6.

Description: Shell small to medium in size (up to 35–40 mm), fusiform, slender, chalky, pinkish with 2 weak, diffuse reddish bands along the edge of last whorl lamellae; protoconch symmetrical, cylindrical, smooth, of $2\frac{1}{2}$ whorls; teleoconch of 7 rectangular whorls, spire $\frac{1}{3}$ of total shell height. Spire angle about 45° , suture impressed, subsutural shelf straight, aperture small, circular, interior glossy white; anterior siphonal canal long, open, straight, with the tip adaxially curved, equal to aperture height; umbilicus slightly open, sometimes only a narrow slit; outer lip reflexed to form lamellae; inner lip curved, with white adpressed callus. Axial ornamentation of 9–11 regular, low lamellae, covering entire whorl surface; lamellae forming a back-turned spine at periphery. Spiral ornamentation of 2 to 3 very weak threads in first whorls becoming more than 7 in last one, sometimes only visible along edge of last whorl lamellae. Siphonal fasciolae slightly oblique, always present.

Operculum triangular (tear-shaped), with terminal nucleus. External surface covered by irregular growth lines. Inner surface attachment area with horseshoe-shaped scars; glazed rim weak but present (Figure 88).

Radula rachiglossate with rachidian teeth wider than high, central cusp thin, in a different plane than laterals; lateral cusps wider and shorter than central cusp, with inner edge oblique; sharp straight denticle in the upper third of the internal edge of the lateral cusp, external edge with almost obsolete denticles numbering 3–4. Base of rachidian tooth slightly sinuous, sliding beneath base of next tooth. Marginal area with single conspicuous

cusp. Lateral teeth with single, long and narrow cusp, slightly attached basal plate (Figures 92–93).

Type Material: [*T. pelseneeri*] BMN11 1915.4.1S.276–7, two syntypes from west of Malvinas Is. in 229 m (Figures 79–82) and [*T. orbignyi*] MACN-In 24421, Puerto Quequén, Buenos Aires, holotype (Figures 83–85) and 10 paratypes.

Additional Material Examined: Macaé, Rio de Janeiro, Brazil, August 1969, 2 A, 55 m (USNM S46550); Macaé, Rio de Janeiro, Brazil, 1 A, 30 m (AMNH 187586); Rio de Janeiro, Brazil, 1 A (AMNH 241045); off Rio de Janeiro, Brazil (ANSP 289807); $34^\circ 48' 7''$ S, $54^\circ 21' 9''$ W, 1 A, R/V ALDEBARAN, Cruise 9901, Sta. 25, 27 January 1999, 25 m, with Piccard trawl (MNHN 15400).

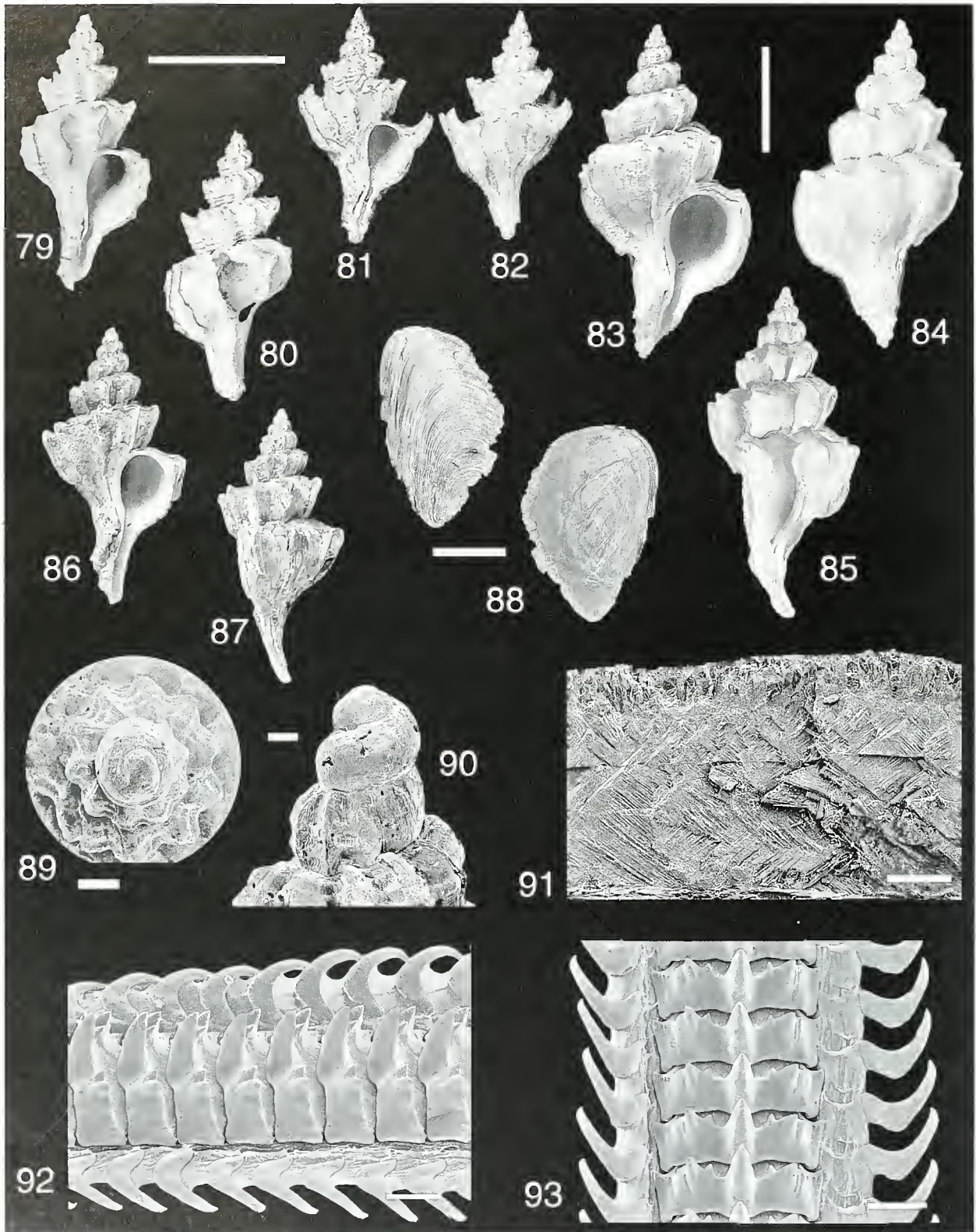
Distribution: Rio de Janeiro, Brazil, to Uruguay and Buenos Aires province, Malvinas Is. Rios (1994) cited it from dredgings from 55 to 225 m off the Brazilian coast.

Remarks: This is a rare species occasionally collected by fishermen on the mussel banks off Buenos Aires province. It was originally described from Sta. 35 of the British Antarctic (“Terra Nova”) Expedition, west of Malvinas (Falkland) Islands in 125 fathoms depth. However, together with this species, the author mentioned several others not reported before or since from this latitude, but which occur at Station 42 of the same expedition, off Rio de Janeiro. This leads to the supposition that the material from these stations could have been mixed up (Scarabino, 2003: 199).

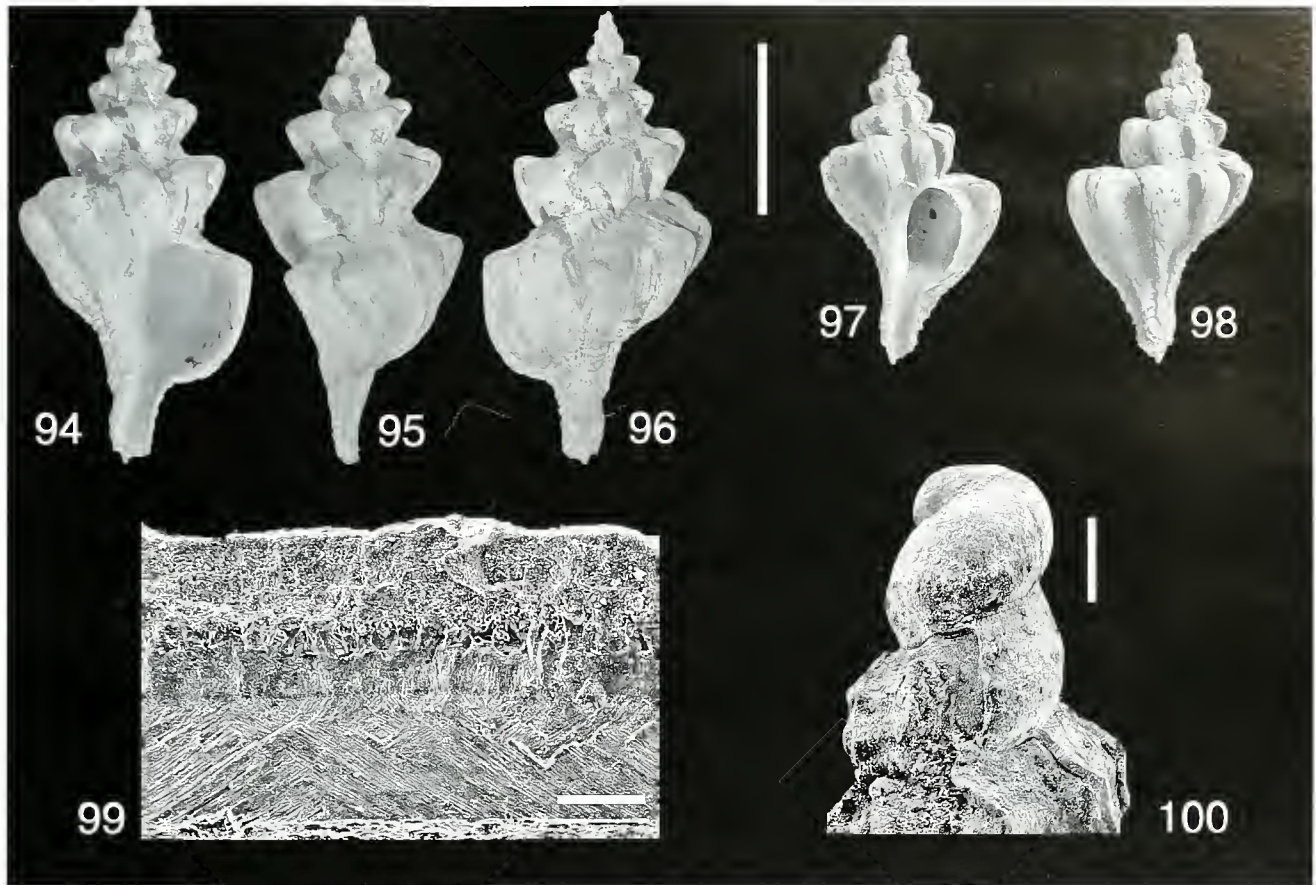
Trophon amettei Carcelles, 1946
(Figures 94–100)

Trophon amettei Carcelles, 1946: 84, fig. 13; Carcelles and Williamson, 1951: 257.

Description: Shell small in size (up to 30 mm), fusi-



Figures 79–93. *Trophon pelsucceri* E. A. Smith, 1915. **79–80.** BMNH 1915.4.18.276-7 syntype. **81–82.** BMNH 1915.4.18.276-7, other syntype. **83–85.** *T. orbignyi* Carcelles, MACN-In 24421 holotype. **86–87.** MNHNM 15100, B/I ALDEBARAN, 34°045'7" S, 54°21'9" W, in 25 m. Scale bar = 1 cm. **88.** Two views of the operculum of the specimen in Figures 86–87. Scale bar = 2 mm. **89–90.** USNM S-16550, apical and lateral view of the protoconch. Scale bars = 100 and 300 μ m respectively. **91.** Detail of the ultrastructure of the shell. Scale bar = 100 μ m. **92–93.** Dorsal and lateral view of the radula of the specimen in Figures 86–87. Scale bars = 30 μ m.



Figures 94–100. *Trophon amettei* Carcelles, 1946. 94–96. MACN-In 23510, holotype, 45°09' S, 66°27' W in 11.28 m. 97–98. MACN-In 23510, paratype. Scale bar = 1 cm. 99. MACN-In 23510, ultrastructure of the shell. Scale bar = 30 μ m. 100. MACN-In 23510, protoconch, uncoated SEM picture. Scale bar = 300 μ m.

form, biconic, chalky whitish; protoconch elongate, smooth, of $2\frac{1}{4}$ whorls; teleoconch of 6 strongly shouldered whorls, spire less than $\frac{1}{2}$ of the total shell height. Spire angle about 45°. suture impressed; subsutural shelf short but straight, aperture small, ovoid, interior glossy white; anterior siphonal canal comparatively long, almost same height as aperture, open and straight; umbilicus closed, inner lip adpressed. Axial ornamentation of 8 regular concave lamellae per whorl. Lamellae growing attached to entire whorl surface and producing concave spine along periphery. Spiral ornamentation of 2 cords in first teleoconch whorls that soon become obsolete on subsequent whorls. Last whorl with 6–10 cords on lower part. Shell ultrastructure composed of two layers, similar to *T. geversianus*. Operculum and soft parts unknown.

Type Material: Holotype and 15 paratypes (MACN-In 23510) all from 45°09' S, 66°27' W anchorage Restinga Aristizábal, Chubut province, in 8 fathoms (11.28 m), rocky bottom associated with the calyptraeids *Crepidula cachimilla* and *Calyptrea pileolus*.

Remarks: This is a rare species known only from the type locality. It has not been found again. The regular concave lamellae, are in fact, unusual for the genus. The

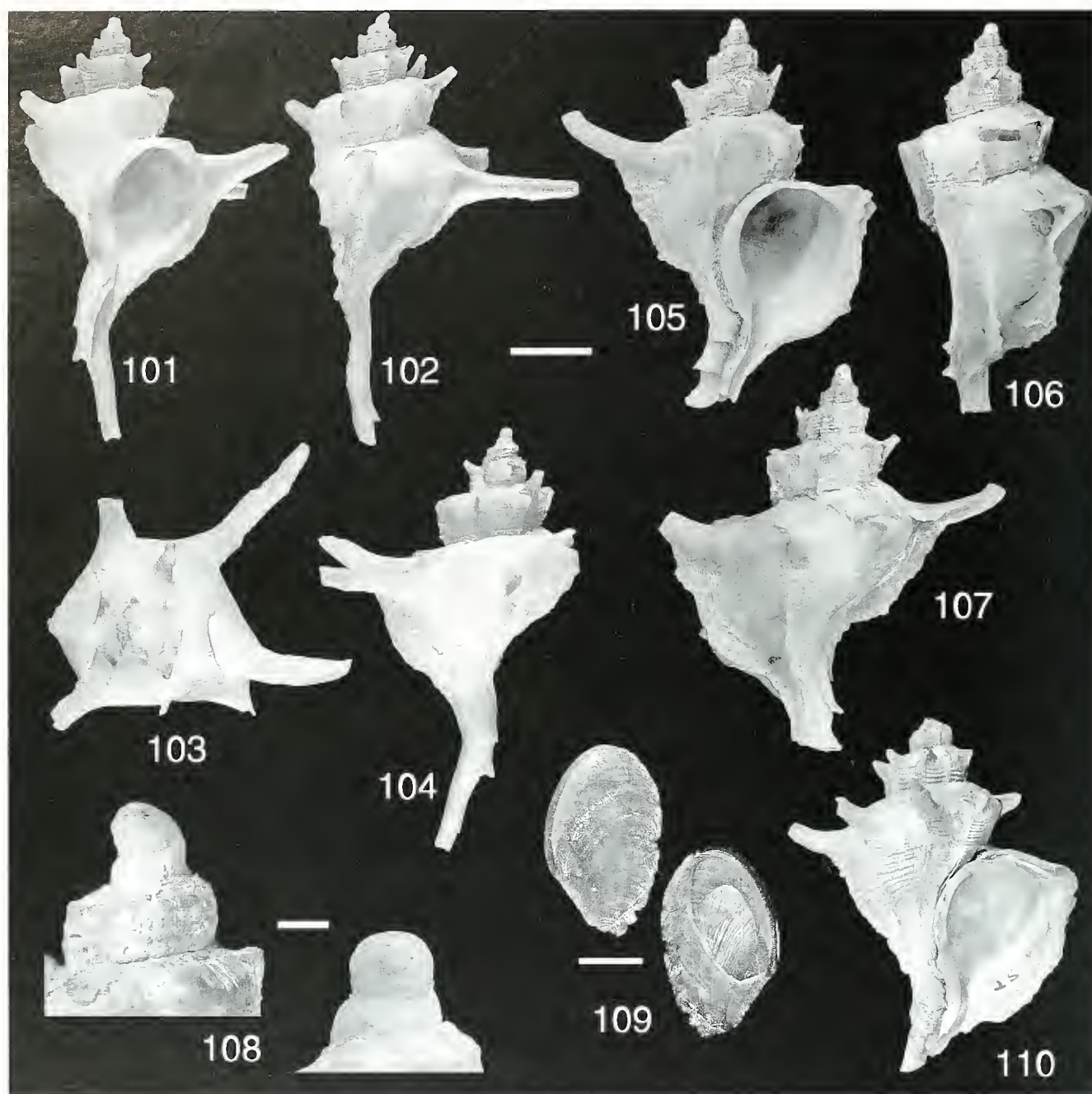
protoconch resembles those usually found in the genus *Fuegotrophon*, however the typical fimbriate spiral ornamentation is absent. *Trophon pelseneeri* has a comparable profile, however it is easily segregated: where the latter has lamellae forming a back-turned spine at periphery, *T. amettei* presents a characteristic and unique concave lamellae. In addition *T. pelseneeri* has a slightly open umbilicus while in *T. amettei* it is invariably closed. Examination of the radula may beget a new generic allocation for this species.

Trophon clenchi (Carcelles, 1953)
(Figures 101–114)

Murex clenchi Carcelles, 1953: 7, figs. 23–25; Castellanos, 1970: 80, pl. 5, fig. 7; Fair, 1976: 31, fig. 15; Vokes, 1992b: 24; Rios, 1994: 115.

Poirieria (*Poirieria*) *clenchi* (Carcelles).—Vokes, 1970: 18.

Description: Shell medium in size, delicate, thin, chalky, translucent white; protoconch known only from the holotype, asymmetrical, globose, of 2– $2\frac{1}{2}$ whorls; teleoconch of 5 shouldered whorls; spire short, less than $\frac{1}{4}$ of total shell height. Spire angle about 45° (without spines); suture impressed, subsutural shelf short,



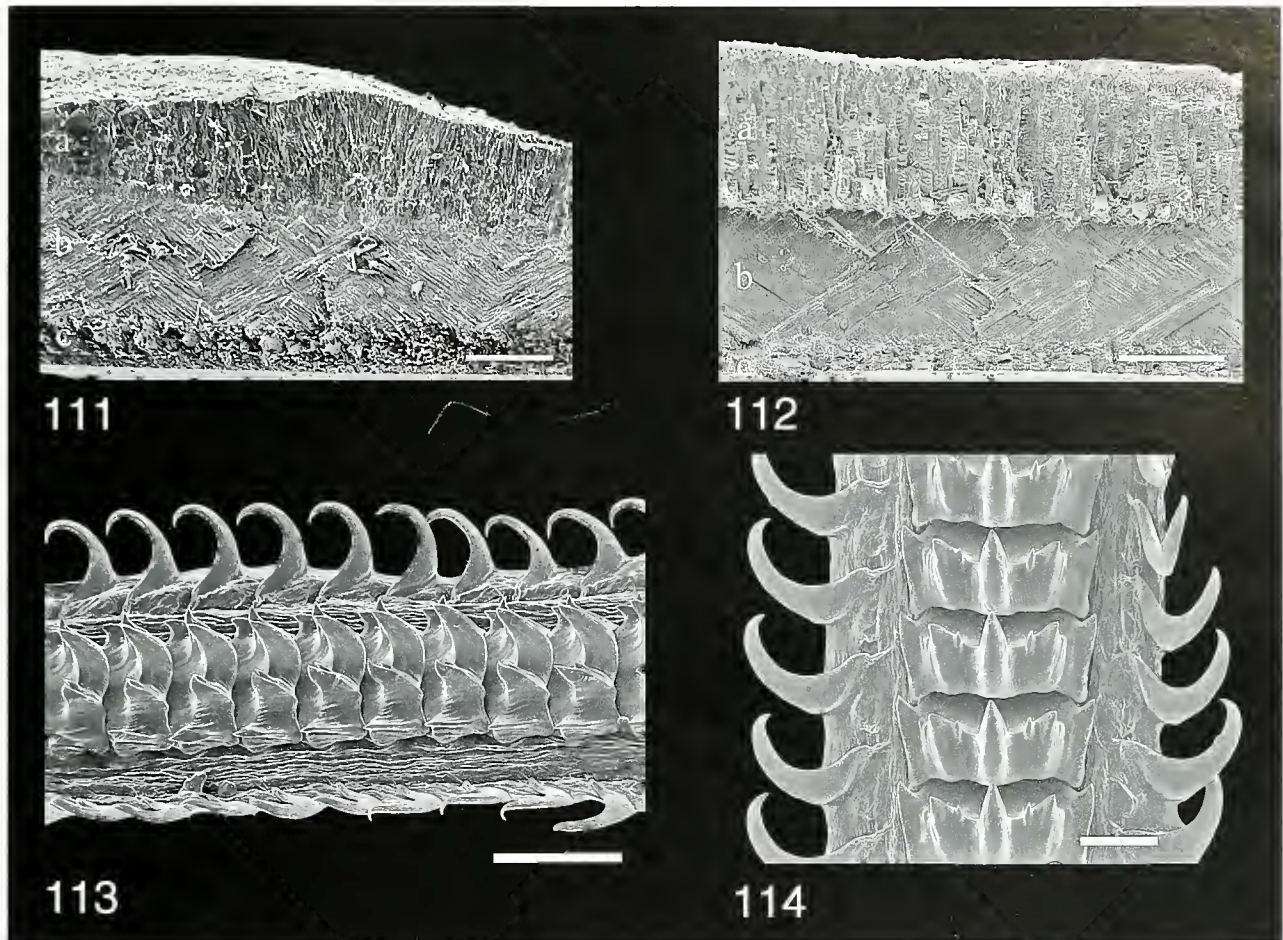
Figures 101–110. *Trophon clenchi* (Carcelles, 1953). **101–104.** MACN-In 25146, holotype, 35°24' S, 55°36' W in 89.61 m. **105–107.** MACN-In 36269, approximately 45°10' S, 57°20'. Scale bar = 1 cm. **108.** Holotype, protoconch. Scale bar = 1000 μ m. **109.** External and internal views of operculum of specimen in Figures 105–107. Scale bar = 0.5 cm **110.** MACN-In 25146, paratype.

straight; aperture suboval, interior glossy white; anterior siphonal canal very long (longer than the aperture height), deep and slightly curved in the beginning and then straight, open but narrow; outer lip sharp, inner lip somewhat protruding, adpressed. Axial ornamentation of 7–9 regular axial lamellae growing across entire whorl surface, but attached to shell producing open, long and regularly spaced spines along periphery. Spiral ornamentation of 4–5 rounded cords on lower half of first whorls,

becoming more than 20 in the last. Delicate growth lines present on entire shell surface.

Shell ultrastructure composed of two layers following the common pattern of the genus: innermost layer (40% of total thickness of shell) composed of crossed lamellar aragonite, outer layer (50%) of amorphous calcite. Sometimes, depending on the fracture mode, a basal aragonitic layer can be observed.

Radulae rachiglossate, rachidian teeth with three me-



Figures 111–114. *Trophon clenchi* (Carcelles, 1953). **111.** USNM 901774, 51°58' S, 56°38' W, R/V ELTANIN Cruise 7, Sta. 558, 646–845 m, ultrastructure of the shell. Scale bar = 100 μ m. **112.** *Poirieria zelandica*, ultrastructure, commarginal fracture surface. Scale bar = 100 μ m. **113.** *Trophon clenchi* MACN-In 36269. Lateral view of radula ribbon. Scale bar = 100 μ m. **114.** Dorsal view of radular ribbon. Scale bar = 50 μ m.

dian cusps, the central one the larger and the lateral ones with a denticle, attached to the upper third of the interior margin of the lateral cusp; external margin with 2–3 obsolete denticles. Rachidian base sinuous, with the base offset under the proximal tooth. Marginal cusps single, never bifid. Lateral teeth curved, thin, with attachment area also thin (Figures 113–114).

Operculum triangular or suboval tear-shaped, attachment area elliptical, with horseshoe shape scars.

Type Material: 38°24' S, 55°36' W, off Mar del Plata, in 59.6 m, holotype and paratype (MACN-In 25146).

Additional Material Examined: 51°58' S, 56°38' W, 3 D, R/V ELTANIN Cruise 7, Sta. 558, 646–845 m (USNM 901774), 41°51' S, 57°34' W, collected by Uruguayan fishermen, June 2002, 1062 m, IA, MACN-In 36270; approximately 45°10' S, 57°20' Uruguayan fishermen, I A, MACN-In 36269; 54°50' S, 63°50.5' W, 2.5 miles south Punta Fallows, Isla de los Estados, Tierra del Fuego, I A, R/V HERO Cruise 715, Sta. 715/879, 28 October 1971, in 342–353 m (LACM 71-331).

Distribution: Known from off Buenos Aires province, Patagonia and Isla de los Estados, in 90–1050 m depth.

Remarks: Carcelles (1953) described *Murex clenchi* from two shells he received from the crew of the ARA Bahía Blanca, an Argentine Navy ship that occasionally collected material for the collection of the Museo Argentino de Ciencias Naturales (MACN). Both holotype and paratype were collected from the continental shelf off Buenos Aires province. This material remained housed at the MACN until it was sent on loan and it appears to have been lost for almost 30 years (see Castellanos, 1986). The return of the material to MACN made the type material again available for studies. Perhaps because of these facts, the ordinary quality of the illustration and the absence of soft parts, the species was always reluctantly considered as the southernmost representative of the genus *Murex*.

E. H. Vokes, in a fundamental paper published in 1970, stated that *Murex clenchi* belongs in the genus *Poirieria* sensu stricto. Rios (1994) considered *M. clenchi*

as an anomalous specimen of *Trophon acanthodes* Watson, a species that slightly resembles some specimens of *M. clenchi* (e.g., the paratype).

The morphology of the shell as well as the radula and penis of *Murex clenchi* allow the allocation in the genus *Trophon*. In fact, this was already suggested by E. H. Vokes (1992b). After studying the material of *T. acanthodes* housed at the MACN she proposed that *M. clenchi* belongs to *Trophon sensu lato* and not to *Poirieria*. It bears no relationship with *Poirieria* despite some apparent shell similarity. As it is shown in Figure 112, *Poirieria zelandica*, type species of *Poirieria*, has no calcitic layer on the shell but a thick aragonitic one instead (Figure 112a). In contrast, the entire group of Patagonian *Trophon* (*T. clenchi* in particular), shows different degrees of development of the typical calcitic layer on the distinct species.

The range of the very few lots studied falls within the geographic distribution of other species of *Trophon*. *Trophon clenchi* was known from two quite different geographic and bathymetric areas: off Buenos Aires province (in about 90 m) and the slope off Patagonia. A new lot is recorded here from Isla de los Estados, which significantly increases the range of distribution of the species. It is possible that like other Patagonian species of the genus, *T. clenchi* would be associated to hard bottoms, thus hampering the collection of material. Its fragility, size, and inadequate sampling of the area adds other reasons for the scarcity of records. It is suggested that these variables accounts for the disjoint recorded distribution of this species. In fact, this species started to be repeatedly collected recently, when the fishery of the Patagonian toothfish (*Dissostichus eleginoides*) on the Argentinean slope provided the opportunity to catch accidentally entangled specimens (F. Scarabino, pers. comm.).

Trophon wilhelmensis Ramirez-Bohme, 1981
(Figures 115–119)

Trophon (Enixotrophon) wilhelmensis Ramirez-Bohme, 1981:
6, fig. 1a, b.

Description: Shell of medium size, about 52 mm high, slender in profile, chalky white; protoconch unknown; teleoconch of 6 shouldered whorls; spire less than $\frac{1}{3}$ of total shell height. Spire angle less than 45° ; suture impressed, subsutural shelf straight, aperture small, subcircular, interior glossy white; anterior siphonal canal very long (longer than aperture height) deep, straight or curved, always open; outer lip rather reflexed, rounded, inner lip adpressed. Axial ornamentation of 12–15 regularly spaced, axial lamellae, slightly raised, almost attached along the entire whorl, producing open, conspicuous, regularly spaced spines at periphery; spines becoming more closely packed on last whorl. Spiral ornamentation of 4–5 weak rounded threads on the lower part of the first whorls, becoming more than 20 in last one. Growth lines present throughout shell, producing wrinkly surface by intersection with spirals.

Operculum elliptical, nucleus terminal. External surface covered by growth lines. Inner surface with marginal rim; attachment area, horseshoe-shaped scars present.

Rachidian teeth of about 90 μm wide, central cusp large; lateral cusps shorter than central cusp, inner edge with conspicuous denticle, external edge with 5 denticles of equal size. Base of rachidian tooth straight, somewhat sinuous, sliding beneath base of next tooth. Marginal area with single cusp. Lateral teeth thin with single, long cusp, slightly attached basal plate.

Type Material: Holotype in MNHN (unnumbered), $41^\circ 51' \text{ S}$, $74^\circ 30' 5'' \text{ W}$ West of Chiloé Island in 250 m.

Additional Material Examined: Boca del Guafo, $43^\circ 39' 36'' \text{ S}$, $73^\circ 51' 11'' \text{ W}$, southern Chile, 6 July 2002, I A, 200 m (MNHN unnumbered).

Distribution: Known only from the holotype and another lot, both from the same area and depth, around the Chiloe Is., Chile.

Remarks: *Trophon wilhelmensis* was recently described from Chile with no mention of the similarity with *T. acanthodes*. Both species are actually quite similar. The species, known only from the holotype and another specimen, may be distinguished from *T. acanthodes* mainly by the upturned spines (compare Figures 66–73 with Figures 115–117). In addition, slight differences in the morphology of the rachidian teeth allow for further differentiation of the two species. Notwithstanding, future studies of specimens from intermediate localities could demonstrate that these represent but a single species.

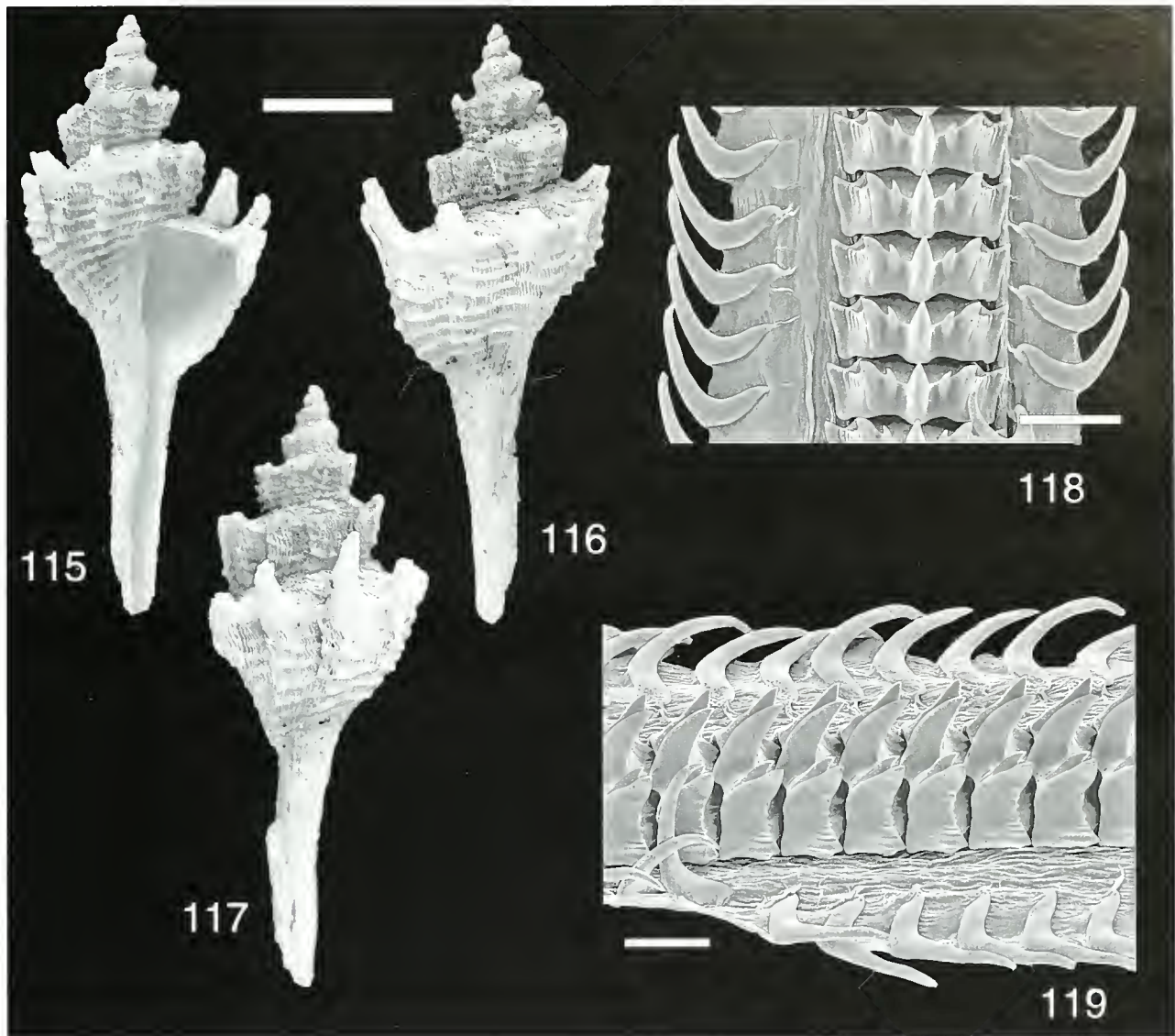
Trophon bahamondei McLean and Andrade, 1982
(Figures 120–125)

Trophon bahamondei McLean and Andrade, 1982: 10, figs. 24–25.

Description: Shell of medium size, up to 50 mm, slender, with narrow profile, chalky or creamy white; protoconch unknown (worn in all specimens); teleoconch of 6 shouldered whorls; spire less than $\frac{1}{2}$ of total shell height. Spire angle about 45° ; suture impressed, subsutural shelf well defined, straight; aperture subcircular, interior chalky white; anterior siphonal canal very long (equal to aperture height), narrow, and curved, open; outer lip sharp, rounded, inner lip adpressed. Axial ornamentation of 11–13 regular axial lamellae growing on entire whorl surface, but attached to the shell and producing open, short and regularly spaced spines along periphery. Spiral ornamentation lacking. Growth lines present throughout shell.

Operculum elliptical, nucleus terminal. External surface covered by concentric, irregular growth lines. Inner surface attachment area reaching upper side or center, with horseshoe-shaped scars (Figure 123).

Radula with rachidian teeth very wide ($\sim 114 \mu\text{m}$), with narrow base, central cusp thin, large; lateral cusps



Figures 115–119. *Trophon wilhelmensis* Ramirez-Bohme, 1981. 115–117. MNHNS unnumbered, Boca del Guafo, 43°39'36" S, 73°51'11" W, southern Chile, 6 July 2002, 200 m. Scale bar = 1 cm. 118–119. Radula of the specimen on Figures 115–117, 118. Frontal view. Scale bar = 50 μ m. 119. Lateral view. Scale bar = 40 μ m.

wider and shorter than central cusp, inner edge with sharp, curved denticle, external edge with denticles decreasing in size toward lateral edge where they disappear. Base of rachidian tooth sinuous, inserted in part under base of subsequent tooth. Marginal area with single conspicuous cusp. Lateral teeth with single, long and very narrow cusp, slightly attached basal plate. Central cusps of rachidian teeth curved back in lateral view (Figures 124–125).

Animal very similar to *T. plicatus*. Osphradium less than half ctenidium length, asymmetrical, with 60–70 leaflets. Ctenidium with 140 leaflets less than two times larger than those of osphradium. Tentacles well defined; eyes deeply marked. Same type of accessory salivary glands, twisted and non-compact.

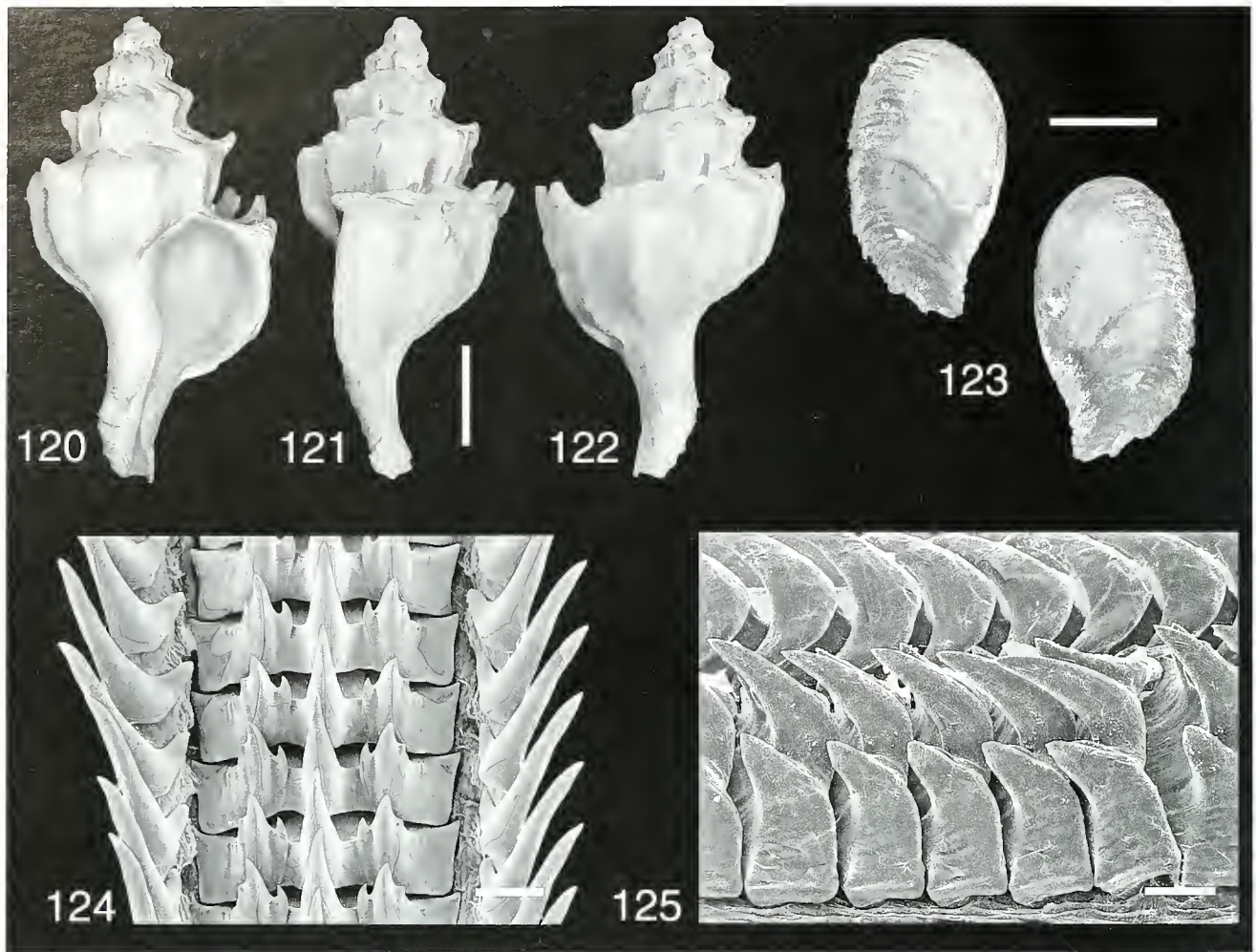
Male unknown, all specimens studied were females. Female similar to *T. geversianus*.

Type Material: Holotype from off Pichilemu, Chile, 34°27' S, 340 m (LACM 1982, but apparently on loan) and two paratypes, 34°27' S, 71°54' W, 25 May 1976, 200–450 m (USNM 784739).

Additional Material Examined: 31°56' S, 71°54' W, off Los Vilos, Chile, 2 A, 8 March 1977, 240–350 m (LACM 72491); off Playa Blanca, Coquimbo, Chile, 400 m (ANSP 291065); off Coquimbo, Chile (LACM 75-88).

Distribution: This is a deep water *Trophon* known from latitudes 30° to 34° S off the coast of Chile.

Remarks: *Trophon bahamondei* is apparently a very



Figures 120–125. *Trophon bahamondei* McLean and Andrade, 1982. **120–122.** Paratype USNM 784739, 34°27' S, 71°54' W, Pichilemu, Chile, in 200–450 m. Scale bar = 1 cm. **123.** Operculum, external (right) and internal (left) views. Scale bar = 1 cm. **124.** Dorsal view of radular ribbon. Scale bar = 30 μ m. **125.** Lateral view of rachidian teeth. Scale bar = 30 μ m.

consistent species from the morphological standpoint. It was only recently described despite its apparently widespread presence in shrimp trawls. The deeper water habitat of species (more than 200 m) probably rendered the species less accessible in the past.

General morphology of shell and gross anatomy shows at first glance some similarities with those of *T. plicatus*; however close examination of shell and radula confirms the presence of a different species.

Trophon parodizi new species
(Figures 126–137, Table 1)

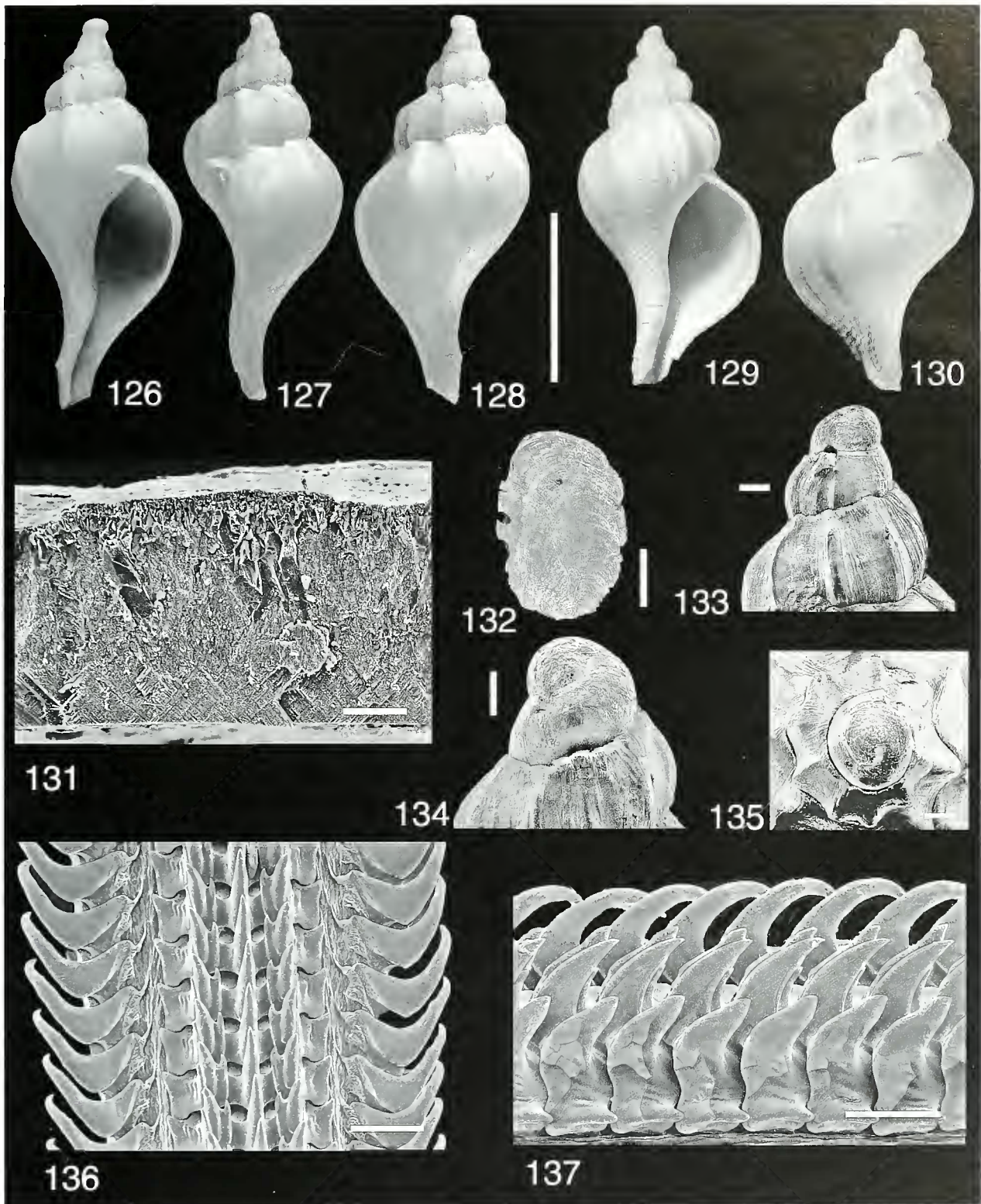
Description: Shell medium in size (up to 23 mm), very thin, chalky; protoconch smooth, of $1\frac{1}{2}$ (1.41×1.39) very asymmetrical whorls; transition to teleoconch well defined; teleoconch of 4 convex whorls, spire less than $\frac{1}{3}$ total shell height. Spire angle about 40°; suture impressed; aperture subovoid, interior glossy white; anterior siphonal canal medium in size (less than half

height of aperture), narrow, open; umbilicus absent; outer lip rounded. Axial ornamentation of irregular, low, rounded ridges occupying entire whorl surface, numbering up to 9 in early whorls, but vanishing and undulate on last whorl. Spiral ornamentation poorly developed or almost smooth, when present consisting of obsolete, weak cords mostly developed on last whorl. Irregular growth lines present throughout shell.

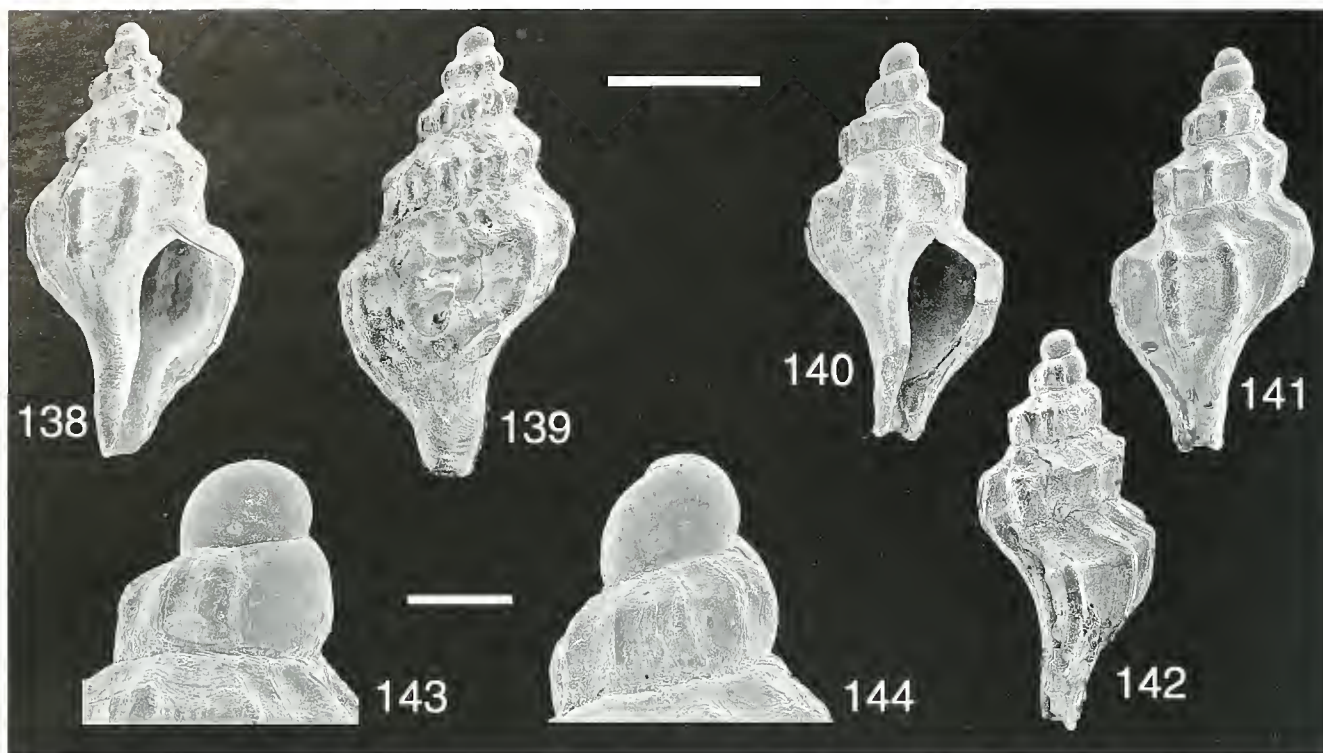
Shell ultrastructure composed of two layers; innermost layer thin (35% of shell thickness), composed of colabradly aligned crossed lamellar aragonite, outer layer thick (65% of shell thickness) with amorphous calcite.

Operculum oval, with terminal nucleus. External surface covered by concentric, irregular, growth lines. Inner surface attachment area with two or three horseshoe-shape scars. Animal unknown.

Radula rachiglossan with rachidian teeth distinctive, central cusp thin, large; lateral cusps almost same size as central cusp, sharp denticle on upper third, irregular external denticles present. Base of rachidian tooth sim-



Figures 126–137. *Trophon parodizi* new species. 126–128. USNM 896397, holotype, 54°56' S, 65°03' W, in 229–265 m. 129–130. USNM 896397, paratype, coated with ammonium chloride. Scale bar = 1 cm. 131. Ultrastructure, fracture surface commarginal. Scale bar = 20 μm . 132. USNM 896397, operculum, external view. Scale bar = 0.5 cm. 133–135. Protoconch of the paratype, three views. Scale bar for all figures = 400 μm . 136. Dorsal view of radular ribbon. Scale bar = 40 μm . 137. Lateral view of rachidian teeth. Scale bar = 40 μm .



Figures 138–144. “*Trophon*” *malvinarum* Strebel 1908. **138–139.** NHRM 1041, holotype, 52°29' S, 60°36' W. **140–142.** MACN-1023944-2, 55°07' S, 66°33' W. **143–144.** Protoconch. Scale bar = 400 μ m.

uous, sliding beneath base of next tooth. Marginal area with a conspicuous cusp. Lateral teeth with single, long cusps and narrow, slightly attached basal plate.

Type Material: Holotype and one paratype from 54°56' S, 65°03' W, Le Maire Strait, R/V ELTANIN Cruise 11, Sta. 969, 10 February 1964, 229–265 m, Blake trawl (USNM S96397) (Map 1).

Material Examined: Only holotype and paratype.

Distribution: Known only from the type locality.

Etymology: This species is named after Juan José Parodiz, one of the pioneers of malacology in Argentina, Curator Emeritus at the Carnegie Museum, Pittsburgh, and a good friend.

Remarks: *Trophon parodizi* is an unusual species within *Trophon*. The small, very thin shell, almost completely smooth and devoid of lamellae, is an exception for the Patagonian *Trophon*. However, the radula and protoconch match those typical of the genus. The radular morphology resembles that of *T. plicatus* where the denticles of the lateral cusp of the rachidian teeth are placed along the entire external edge of the lateral cusp. In *T. parodizi* the lateral cusp is thinner and the denticles are more clearly separated from it and placed mainly along the marginal area as in *T. bahamondei*. In addition—a character also present in *T. bahamondei*—most internal denticle lies against the lateral cusp and is clearly differentiated from the rest.

“*Trophon*” *malvinarum* Strebel, 1908
(Figures 138–144)

Trophon malvinarum Strebel, 1908: 44, figs. 16 a–c; Carcelles and Williamson, 1951: 259; Castellanos and Landoni, 1993: 10, pl. 2, fig. 29.

Description: Shell small, up to 30 mm, thick, fusi-form, profile slender, chalky; whitish; protoconch globose, somewhat cylindrical, with two whorls; teleoconch of 4½ shouldered whorls, spire less than 1/3 of total shell height. Spire angle about 45°; suture impressed; sub-sutural shelf abaxially oblique, aperture subquadrate, anterior siphonal canal moderately long (same height as aperture); umbilicus closed, outer lip polygonal to rounded; inner lip slightly curved, adpressed. Axial ornamentation of 8–9 regular, distinct low varices, which never develop into full-fledged lamellae. Spiral ornamentation of about 3 cords, filling interspaces between consecutive varices, and beginning at periphery of whorls.

Radula and anatomy unknown.

Table 1. Measurements of the type specimens of *Trophon parodizi* new species in mm.

| Species | Length | Width | Whorls |
|--------------------|--------|-------|--------|
| <i>T. parodizi</i> | | | |
| Holotype | 23 | 11 | 4 |
| Paratype | 21.1 | 10.6 | 4 |

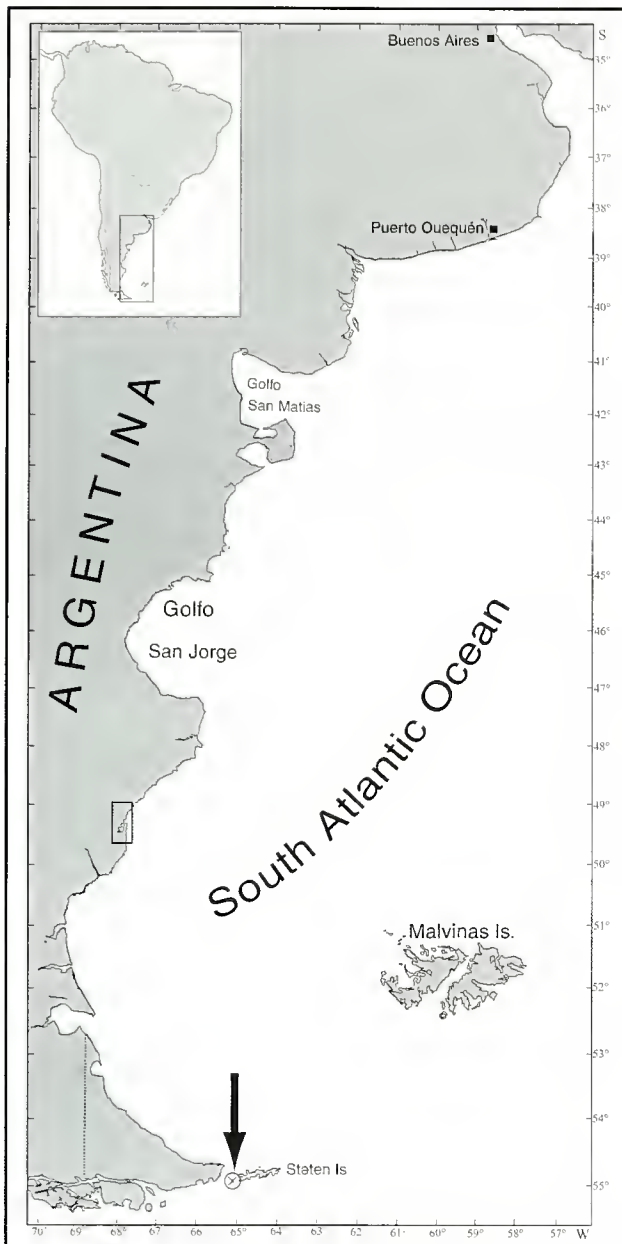


Figure 145. Map showing the type locality of *T. parodizi* new species (◆).

Type Material: 52°29' S, 60°36' W, West Falkland (Malvinas) Is., Svenska Sudpolar Expedition, 11 September 1902, Sta. 58, 197 m (NIIRM 1041).

Additional Material Examined: 55°07' S, 66°33' W, 1 D, 83 m (MACN-In 23944-2).

Distribution: Around Malvinas Is. and the Magellanic region.

Remarks: "*Trophon*" *malvinarum* is a rare species known from only one specimen other than the holotype. It was originally described in the genus *Trophon*; however, the protoconch is somewhat shorter and symmet-

rical and the shell never develops true lamellae but low varices. It probably could be better assigned in the genus *Urosalpinx*. Assessment of its real affinities must wait until specimens with soft parts preserved can be studied.

CONCLUDING REMARKS

The geographic distribution of the species of the genus *Trophon* sensu stricto is restricted to the southwestern Atlantic and the southeastern Pacific Oceans. This distribution is certainly a consequence of their larval biology. Planktonic larval development is unknown to occur in the genus. Moreover, the larvae do not need to move any significant distance either for feeding or reproductive purposes—those from shallow water habitats live on mussel banks on which they feed and mate. Such a condition is reflected in the enormous morphological variation shown by the shells of the different species, particularly in *T. geversianus*. While most of the species are well known, some others were only collected in a single location (e.g., *T. amettei*) and therefore their range of variation remains to be known.

Radular and anatomical features suggest that the entire *Trophon* group from Patagonia is very homogeneous. All the species included in this genus have several common radular features. The most remarkable are: the intermediate denticle attached to the upper third of the internal edge of the lateral cusp of the rachidian teeth; a single marginal denticle in the external edge of the base of the rachidian teeth; the attachment area of the marginal teeth are always (no exceptions known) narrow, thin, with the free part of same thickness, and the central cusp of the rachidian is always thin and larger than the laterals (see also Pastorino, 2002).

The Antarctic species so far assigned to *Trophon* and the boreal ones recently included in the genus *Boreotrophon* (see Egorov, 1993) have the inner denticle between central and lateral cusp of the rachidian teeth always free, attached to the base of the teeth. In addition, most of the radulae of these northeastern Atlantic species—according to Bouchet and Warén's revision (1985)—have a broad attachment of the marginal teeth.

Conchological features are so variable that I considered them as secondary. However, the protoconchs are actually very different and allow for the division in at least two clearly defined groups. There is no ornamentation on the protoconchs of Patagonian representatives of *Trophon*, whereas most of the boreal species of *Boreotrophon* have a delicate pattern of irregular threads. The Antarctic species have also no ornamentation in the protoconch with only one exception: *T. scotianus* Powell, 1951 which has apparently the same pattern observed in North Atlantic *Boreotrophon* species.

There are several anatomical features that characterize the group of species living along the South American coast. The accessory salivary glands, when known, are usually tubular; the esophagus produces a typical esophageal loop after the valve of Leiblein and posteriorly runs appressed to the left side of the gland of Leiblein;

the esophageal glands in the mid-esophagus are inconspicuous, not externally visible; and finally, the penises are always dorso-ventrally flattened, with a large papilla and a simple *vas deferens* either closed by the overlapping sides of the penis or open.

The features mentioned above and the geological story of the two areas, Antarctica and Patagonia, allow for the clear differentiation of these two groups.

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LITERATURE CITED

- Adams, H., and A. Adams. 1853–1854. The Genera of Recent Mollusca, arranged according to their organization, Volume 1. John van Voorst, Paternoster Row, London. 484 pp. [pp. 1–156, 1853; pp. 257–484, 1854].
- Aguirre, M. L. 1993. Type specimens of Quaternary marine gastropods from Argentina. *Ameghiniana* 30: 23–38.
- Bouchet, P., and A. Warén. 1985. Revision of the northeast Atlantic bathyal and abyssal Neogastropoda excluding Turridae (Mollusca, Gastropoda). *Bolletino Malacologico*, suplemento 2: 123–296.
- Calvo, I. S. 1987. Rádulas de Gastrópodos Marinhos Brasileiros. Editora da Fundação Universidade do Rio Grande, Rio Grande. 201 pp.
- Carcelles, A. 1943. Observaciones sobre *Trophon varians* d'Orbigny. *Notas del Museo de La Plata, Zoología* 8(72): 431–437.
- Carcelles, A. 1946. Observaciones sobre algunas especies actuales y fósiles de *Trophon* de la República Argentina. *Notas del Museo de La Plata, Zoología* 11(93): 59–89.
- Carcelles, A. 1947. Notas sobre algunos gastropodos marinos del Uruguay y la Argentina. I–VI. *Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo* 2(40): 1–27.
- Carcelles, A. 1953. Nuevas especies de gastropodos marinos de las Repúblicas Oriental del Uruguay y Argentina. *Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo* 4(70): 1–18.
- Carcelles, A. and S. Williamson. 1951. Catálogo de los moluscos marinos de la provincia magallánica. *Revista del Instituto Nacional de Investigación de las Ciencias Naturales* 2, *Ciencias Zoológicas*: 225–383.
- Castellanos, Z. J. A. de. 1970. Catálogo de los moluscos marinos bonaerenses. *Anales de la Comisión de Investigaciones Científicas de la provincia de Buenos Aires* 8: 9–365.
- Castellanos, Z. A. de. 1986. Aclaración sobre *Trophon acanthodes* Watson, 1853 (Mollusca Gastropoda). *Neotrópica* 32 (87): 22.
- Castellanos, Z. J. A. de. and N. Landoni. 1993. Catálogo descriptivo de la malacofauna marina magallánica 9. Neogastropoda: Muricidae y Thaisidae. *Comisión de Investigaciones Científicas de la Provincia de Buenos Aires*, 26 pp.
- Castellanos, Z. J. A. de., E. Rolán and S. Bartolotta. 1987. Nuevos micromoluscos de la plataforma inferior Argentina y talud superior (Moll. Gastropoda). *Revista del Museo de La Plata, Sección Zoología* 14(156): 93–102.
- Cernohorsky, W. O. 1977. The taxonomy of some southern ocean mollusca (Gastropoda) mainly antarctic and subantarctic. *Records of the Auckland Institute and Museum* 14: 105–119.
- Chemnitz, J. H. 1780. Neues systematisches Conchylien-Cabinet / Geordnet und beschrieben von Friedrich Heinrich Wilhelm Martini und unter dessen Aufsicht nach der Natur gezeichnet und mit lebendigen Farben erleuchtet. Raspe, Nürnberg. Vol. 4, 344 pp. pls. 122–159.
- Cossmann, M. 1903. *Essais de Paléoconchologie comparée*. F. R. de Rudeval, Paris, 151 pp.
- Cristofori, J. D., and G. Jan. 1832. *Catalogus in IV sectiones divisus rerum naturalium in Musaeo exstantium / J. de Cristofori et G. Jan . . . complectens adumbrationem oryctognosiae et geognosiae atque prodromum faunae et florae italiae superioris*. Mediolani, Parmae, Sectio 1, 1–8 pp.
- Dance, P. 1962. The authorship of the Portland Catalogue (1786). *Journal of the Society of Bibliography of Natural History* 4(1): 30–34.
- Dance, P. 1966. *Shell Collecting: An Illustrated History*. Berkeley, University of California Press, Berkeley, 305 pp.
- Dell, R. K. 1971. The marine mollusca of the Royal Society Expedition to southern Chile, 1958–1959. *Records of the Dominion Museum* 7(17): 155–233.
- Dell, R. K. 1990. Antarctic Mollusca with special reference to the fauna of the Ross Sea. *Bulletin of the Royal Society of New Zealand* 27: 1–311.
- d'Orbigny, A. D. 1834–1847. *Mollusques*. In: Bertrand, C.P., (ed.), *Voyage dans l'Amérique Meridionale (Le Bresil, La République Orientale de l'Uruguay, La République Argentine, La Patagonie, La République du Chili, La République de Bolivie, La République du Pérou)*, execute

- pendant les années 1826, 1827, 1828, 1829, 1830, 1831, 1832 et 1833. Chez Ve. Levrault, Paris, 5(3) 755 pp.
- Egorov, R. 1993. Trophoninae (Muricidae) of Russian and adjacent waters. *Ruthenica Supplement*: 11–49.
- Fair, R. H. 1976. The Murex Book: an illustrated catalogue of Recent Muricidae (Muricinae, Muricopsinae, Ocenebriinae). Ruth H. Fair, Honolulu, Hawaii, 138 pp.
- Favanne Montcervelle, J. D. 1780. La conchyliologie, ou histoire naturelle des coquilles de mer, d'eau douce, terrestres et fossiles; avec un traité de la Zoomorphose, ou représentation des animaux qui les habitent: Ouvrage dans lequel on trouve une nouvelle Méthode de les diviser. De Bure, G. Paris, 2, 848 pp.
- Gmelin, J. F. 1791. *Caroli a Linné Systema Naturae per Regna Tria Naturae, Secundum Classes, Ordines, Genera, Species, cum characteribus, differentiis, synonymis, locis*. Editio decima tertia, aucta, reformata, cura J. F. Gmelin. Georg. Emanuel. Beer, Leipzig, 1, part 6 Vermes, pp. 3021–3910.
- Gould, A. A. 1852–1861. Atlas. Mollusca and Shells, p. 512, United States Exploring Expedition. During the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes, U. S. N. Volume 12. C. Sherman and Son, Philadelphia.
- Gray, J. E. 1839. Molluscous Animals. In: *The Zoology of Captain Beechey's Voyage; compiled from the collections and notes made by Captain Beechey, the officers and naturalist of the expedition. During a voyage to the Pacific and Behring's Straits performed in his Majesty's ship Blossom, under the command of Captain F. W. Beechey, in the years 1825, 26, 27 and 28*. H. G. Bolm, London 1: 103–142.
- Griffin, M. and G. Pastorino. 2005. The genus *Trophon* Montfort, 1810 (Gastropoda: Muricidae) in the Tertiary of Patagonia. *Journal of Paleontology* 79: 296–311.
- Hanley, S. 1856. Index Testaceologiens, an illustrated catalogue of British and foreign shells . . . by W. Wood. A new and entirely revised edition. Willis and Sotheman, London, xx + 234 pp.
- Harasewych, M. G. 1984. Comparative anatomy of four primitive muricacean gastropods. Implications for Trophoninae phylogeny. *American Malacological Bulletin* 3: 11–26.
- Houart, R. 1991. The southeastern Brazilian muricidae collected by RV *Marion-Dufresne* in 1987, with the description of three new species. *The Nautilus* 105: 26–37.
- Houart, R. 1998. Description of *Trophon iarae* n. sp., a new muricid from southern West Atlantic (Gastropoda: Muricidae) with illustration of related species. *Apex* 13: 127–130.
- Houart, R. 2003. Description of three new species of *Trophon* s. l. Montfort, 1810 (Gastropoda: Muricidae) from Chile. *Novapex* 4: 101–110.
- Hupé, L. H. 1854. Mollusca, p. 499. In: C. Gay (ed.), *Historia Física y Política de Chile. Zoología* S. Maulde y Renon, Paris and Santiago.
- International Commission on Zoological Nomenclature (ICZN). 1944. Opinion 184. On the status of names first published in volumes 1 to 11 of Martini (F. H. W.) and Chemnitz (J. H.). *Neues systematisches Conchylien-Cabinet*, Nürnberg, 1769–1795. Opinions and Declarations rendered by the ICZN 3(3): 25–36.
- International Commission on Zoological Nomenclature (ICZN). 1957. Opinion 456. Rejection of the work by Thomas Martyn published in 1784 with the title "The Universal Conchologist" as a work which does not comply with the requirements of Article 25 of the "regles" and which therefore possesses no status in zoological nomenclature and rejection also of a proposal that the forgoing work should be validated under the plenary powers. *Opinions and Declarations of the ICZN* 15(22): 395–410.
- Hering, H. von 1907. Les Mollusques fossiles du Tertiaire et du Crétacé supérieur de l'Argentine. *Anales del Museo Nacional de Buenos Aires* (3)7: 1–611.
- Knorr, G. W. 1757–1773. Vermügen der Augen und des Gemüths, in Vorstellung einer allgemeinen Sammlung von Muscheln und andern Geshöpfen, welche im Meer gefunden werden. Nürnberg. 1, 40 pp., 30 pls. (1757); 2, 56 pp., 30 pls. (1764); 3, 52 pp., 30 pls. (1768); 4, 48 pp., 30 pls. (1769); 5, 46 pp., 30 pls. (1771); 6, 18 pp., 40 pls. (1773).
- Knorr, G. W. 1760–1773. Les délices des yeux et de l'esprit, ou collection générale des différentes espèces de coquillages que la mer renferme. Nuremberg. 1, 52 pp., 30 pls. (1760); 2, 65 pp., 30 pls. (1765); 3, 55 pp., 30 pls. (1768); 4, 54 pp., 30 pls. (1770); 5, 48 pp., 30 pls. (1771); 6, 76 pp., 40 pls. (1773).
- Kobelt, W. 1878. Die geschwänzten und bewehrten Purpurschnecken (*Murex, Ranella, Tritonium, Trophon, Hindsia*). In: *Abbildungen nach der Natur mit Beschreibungen*. Begonnen von H. C. Küster, fortgesetzt und beendet von W. Kobelt, Systematisches Conchylien-Cabinet von Martini und Chemnitz. Neu herausgegeben und vervollständigt von H. C. Kuster (nach dessen Tode fortgesetzt von W. Kobelt und H. C. Winkauff). Verlag von Bauer and Raspe, Nürnberg 3 (2), 336 pp.
- Kool, S. P. 1993. Phylogenetic analysis of the Rapaninae (Neogastropoda: Muricidae). *Malacologia* 35: 55–260.
- Lamy, E. 1906. Gastropodes Prosobranches et Pélécy-podes: Expédition Antarctique Française (1903–1905) Commandée par le Dr. Jean Charcot. Masson et Cie. Paris, Sciences Naturelles, 20 pp.
- Lightfoot, J. 1786. A catalogue of the Portland Museum, lately the property of the Duchess Dowages of Portland, deceased: which will be sold by auction by Mr. Skinner and Co. on Monday the 24th of April, 1786, and the thirty seven following days, at twelve o'clock London, 194 pp.
- Martyn, T. 1784. *The Universal Conchologist*, exhibiting the figure of every known shell, accurately drawn, and painted after nature: with a new systematic arrangement by the author Thomas Martyn. Volume 1. T. Martyn, London, pls. 1–80.
- McLean, J. H. and H. Andrade. 1982. Large archibenthal Gastropods of Central Chile Collection from expedition of the R/V *Anton Bruun* and the Chilean Shrimp Fishery. *Contributions in Science* 342: 1–20.
- Melville, J. C., and R. Standen. 1907. The marine mollusca of the Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinburgh* 46: 119–157.
- Michelotti, A. J. 1846. Mittheilungen an Professor Bronn gerichtet. *Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefakten-Kunde*, 1846: 52–56.
- Michelotti, G. 1847. Description des fossiles des terrains miocènes de l'Italie septentrionale. *Naturkundige verhandlungen van de Bataafsche Hollandsche Maatschappye der Wetenschappen te Haarlem* 3(2): 1–408.
- Molina, G. I. 1810. *Saggio sulla storia naturale del Chile*. Bologna, 306 pp.
- Montfort, P. D. D. 1810. *Conchyliologie systématique, et classification méthodique des coquilles: offrant leurs figures,*

- leur arrangement generique, leurs descriptions caracteristiques, leurs noms; ainsi que leur synonymie en plusieurs langues. F. Schoell, Paris, 2, 676 pp.
- Pain, T. 1980. A gallery of Muricids from around the world. *Hawaiian Shell News* 28: 8–9.
- Pallas, P. S. 1774. *Spicilegia Zoologica quibus novae imprimis et obscurae animalium species iconibus, descriptionibus atque commentariis illustrantur*. Berolini, 1 part 10, 41 pp., 44 pls.
- Pastorino, G. 2002. Systematics and phylogeny of the genus *Trophon* Montfort, 1810 (Gastropoda: Muricidae) from Patagonia and Antarctica: morphological patterns. *Bollettino Malacologico* 38 (supplemento 4): 127–134.
- Pastorino, G. and M. G. Harasewych. 2000. A Revision of the Patagonian genus *Xymenopsis* Powell, 1951 (Gastropoda: Muricidae). *The Nautilus* 114: 38–58.
- Penchaszadeh, P. 1976. Reproducción de gastropodos prosobranquios del Atlántico suroccidental. *El género Trophon*. *Physis*, Sección A, 35 (90): 69–76.
- Penna-Neme, L., and J. L. Moreira Leme. 1978. Novas espécies e novas ocorrências de Gastrópodos marinhos da Costa Brasileira (Prosobranchia, Neogastropoda). *Papéis Avulsos de Zoologia* 31: 283–297.
- Perry, G. 1811. *Conchology, or the natural history of shells: containing a new arrangement of the genera and species, illustrated by coloured engravings executed from the natural specimens, and including the latest discoveries*. Bulmer and Co. London, 4 pp., 61 pls.
- Petit de la Saussaye, M. S. 1856. Description de Coquilles nouvelles. *Journal de Conchyliologie* 5: 87–92.
- Philippi, R. A. 1868. *Conchylia nova potissimum magellanica*. *Malakozoologische Blätter* 15: 223–226.
- Powell, A. W. B. 1951. Antarctic and subantarctic Mollusca: Pelecypoda and Gastropoda. *Discovery Reports* 26: 47–196.
- Ramirez-Bohme, J. 1981. *Trophon (Euxitrophon) wilhelmensis* n. sp. (Mollusca, Gastropoda, Muricidae). *Museo Nacional de Historia Natural, Noticiario Mensual* 24 (301–302): 5–7.
- Reeve, L. 1847. Monograph of the genus *Fusus*. *Conchologia Iconica*. Vol. 4, pls. 1–14.
- Rehder, H. A. 1967. Valid zoological names of the Portland Catalogue. *Proceedings of the United States National Museum* 121 (3579): 2–21.
- Rios, E. 1985. *Seashells of Brazil*. Editora da Fundação Universidade do Rio Grande, Rio Grande, 325 pp.
- Rios, E. 1994. *Seashells of Brazil*. 2nd ed. Editora da Fundação Universidade do Rio Grande, Rio Grande, 368 pp.
- Rochebrune, A. T. D. and J. Mabille. 1859. *Mollusques*. Mission Scientifique du Cap Horn. 1852–1853. Volume 6, *Zoologie*, 2. Gauthier-Villars et fils, Paris, pp. 111–129.
- Röding, P. F. 1798. *Museum Boltenianum sive catalogus cimeliorum e tribus regnis naturae quae olim collegerat*. Joa. Fried. Bolten, M. D. pd Pars Secunda continens conchylia sive testacea univalvia, bivalvia and multivalvia, Hamburgo, 199 pp.
- Scarabino, F. 2003. Lista sistemática de los Cephalopoda vivientes de Uruguay. *Comunicaciones de la Sociedad Malacológica del Uruguay* 5: 197–202.
- Schumacher, C. F. 1817. *Essais d'un nouveau système des habitations des vers testacés*. Schultz, Copenhagen, 287 pp.
- Smith, E. A. 1915. *Mollusca Part I Gastropoda Prosobranchia, Scaphopoda and Pelecypoda*. British Antarctic ("Terra Nova") Expedition, 1910. *Natural History Report, Zoology* 2: 61–112.
- Solem, A. 1972. Malacological application of Scanning Electron Microscopy, II. Radular structure and functioning. *The Veliger* 14: 327–336.
- Sowerby, G. B. II. 1846. Descriptions of Tertiary fossil shells from South America. In: Darwin, C. *Geological Observations on South America*. Smith Elder Co, London, Pp. 249–267.
- Sowerby, G. B. II. 1847–1857. *Thesaurus Conchyliorum of Monographs of Genera of Shells*. London.
- Strebel, H. 1904. Beiträge zur Kenntnis der Molluskenfauna der Magalhaen-Provinz. *Zoologischen Jahrbüchern. Abteilung für Systematik, Geographie und Biologie der Tiere*, 21 (2): 171–248.
- Strebel, H. 1908. Die Gastropoden. *Wissenschaftliche Ergebnisse der Schwedischen Sudpolar-expedition 1901–1903 Unter Mitwirkung Zahlreicher Fachgenossen Herausgegeben von Otto Nordenskjöld Leiter der Expedition*. 6, *Zoologie* (2), 111 pp.
- Tapparone-Canefri, C. 1874. *Zoologia del viaggio intorno al globo della Regia Fregata Magenta durante gli anni 1865–68*. *Malacologia (Gasteropodi, Acefali e Brachiopodi)*. *Memorie della Reale Accademia delle Scienze di Torino* (2) 28: 161.
- Tryon, G. W. 1880. Muricinae, Purpurinae. *Manual of Conchology* (1) 2, 289 pp.
- Vokes, E. H. 1970. Cenozoic Muricidae of the western Atlantic region. Part 5. *Pterynotus* and *Poirieria*. *Tulane Studies in Geology and Paleontology* 8 (1): 1–50.
- Vokes, E. H. 1971. Catalogue of the genus *Murex* Linné (Mollusca: Gastropoda); Muricinae, Ocenebrine. *Bulletins of American Paleontology* 61: 5–141.
- Vokes, E. H. 1991. Collecting trophons in Argentina. Part I, Tierra del Fuego. *American Conchologist* 19: 7–10.
- Vokes, E. H. 1991b. Collecting trophons in Argentina. Part II, The Valdes Peninsula. *American Conchologist* 19: 8–11.
- Vokes, E. H. 1992. Argentine trophons revisited—or Dr. Powell, I owe you an apology. *American Conchologist* 20: 3–4.
- Vokes, E. H. 1992b. Cenozoic Muricidae of the Western Atlantic Region, Part IX. *Pterynotus*, *Poirieria*, *Aspella*, *Dermomurex*, *Calotrophon*, *Acantholabia* and *Attiliosa*, additions and corrections. *Tulane Studies in Geology and Paleontology* 25: 1–108.
- Watson, R. B. 1852. Mollusca of H. M. S. "Challenger" Expedition. Part 13. *The Journal of The Linnean Society, Zoology* 16: 358–392.
- Watson, R. B. 1856. Report on the Scaphopoda and Gastropoda collected by H. M. S. Challenger during the Years 1873–76. London, 15 *Zoology* (42), 756 pp.
- Wood, W. 1828. *Index Testaceologicus, an illustrated catalogue of shells, British and foreign, arranged according to the Linnean System*. Second Edition. W. Wood, London, 212 pp.
- Zaixso, H. 1973. Observaciones sobre el desove y embriología de *Trophon geversianus* (Pallas, 1774). *Neotropica* 19 (60): 152–155.